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Abstract

The author believes that his concept “Biased Equilibrium” based on information sharing strategies of individual economic agents brings two scientific paradigms of economics, neoclassical economics and institutional economics together from the origin of general equilibrium to provide holistic view of real world economic and social structures. In this article he goes deep into the concept of dynamics of rational behaviors with respect to diverse self-interests of individual economic agents. Our social or economic institutions can be subjectively modeled as an information biasing chain where individuals are positioned in different abstract coalitions according to interdependence of their payoff functions. The upper layer coalitions virtually control the institutions and they have greater influences on our economy that provokes growth by exhausting energy and other natural resources and causes climate change. His model also provides guidelines for transiting from a growth based economy to a sustainable economy, while solving macro and micro-economic challenges in real time.

1.0 Introduction

The mainstream economic theories developed in the contexts of the 18th–20th centuries when new lands and resources were found and being integrated into a global colonial economy but resource distribution was the major economic challenge. Our world is still experiencing deep poverty, while we have already used up most of our natural resources and fossil fuels. The common people in every nations are either drowning into debts or into poverty. The regions once were rich with natural resources are left with poverty, corruptions and civil wars. Our earth is becoming unlivable because of climate change; depletion of surface water and severe environmental disasters as a consequence.

After World War II, the economy of United States continued to grow and it had become the leading global economic power. A new American group of economists emerged in U.S, called “the institutional economists” before the Wall Street Crash of

1929 due to sudden fall of consumptions. The term “neoclassical economics” was coined by institutional economists Thorsten Veblen (1899) just as Marx was the first to use the term “capitalism” before offering his critique of it (Pluta, 2011).

Nevertheless, in general we can divide the modern day economists into two groups. The first group may be called as the optimists and the second group as the pessimists. The optimistic assumptions are used as foundation of general equilibrium theory like complete set of markets, no enforcement problem and perfect competition. The optimists are induced by Adam Smith’s ‘invisible hand’ proposition. On the other hand, the pessimistic assumptions negate the optimistic assumptions like markets are incomplete and/or information is imperfect, which are true in virtually all economies. Institutional economists such as Ronald Coase, Douglass North fall under the second category. Among others Joseph Stiglitz contributed in Information Economics. All of them won Nobel Prize in economics for their respective contributions. Stiglitz (2000) views the standard proofs of the fundamental theorems of welfare economics, the perfect information assumption was so ingrained it did not have to be explicitly stated. Information Economics provides larger perspective of analysis of the economic problems than that of neoclassical economics.

Neoclassical economics and institutional economics differ fundamentally over the central economic question—how resources are allocated. According to neoclassical theory, market is fully responsible for this, where institutions do not and should not matter. On the other hand, institutional economists put institutions to the forefront of their arguments since they think institutions actually shape the markets behaviors over time. Therefore, they are principally interested in distribution of power in a society and critical about methodological individualism and rational choice—the two core components of the general equilibrium theories of mainstream economics.

In institutional economics, the obvious solution of any economic problem is some degree of institutional reform. The challenge that there is no incentive for those who hold the position to execute the reform if they themselves are the beneficiary of the existing institutional structure. In his famous book “The Theory of the Leisure Class”, Veblen (1899) argued that profit focused businesses protect their existing capital investments and employ excessive credit, leading to depressions and increasing military expenditure and war through business control of political power. He predicted a political revolution in Russia, a major war in Europe and a major

depression in the U.S., but he died just weeks before the 1929 stock market crash. An attempt for a radical institutional reform often costs huge toll on people's lives and the economies. On the other hand, institutional reforms for increasing competition in the market are continuous experiments for maintaining economic growth, which presumes unlimited supply of cheap energy such as from fossil fuel.

Apart from these debates, this article is my quest for a unified theory that also leads to new sustainability concepts based on my own equilibrium concept "Inefficient Equilibrium" (Zaman, 2009) or "Biased Equilibrium" (Zaman, 2012a) derived from the same origin of general equilibrium. It can explain evolution of our economic and political history as well as addresses the current economic challenges, including poverty, financial crisis, peak oil and climate change. Finally it proposes a strategy for massive switch-over from the existing growth-based economy to a sustainable economy by bringing the existing and potential sufferers, eventually everyone, under a common economic framework, while solving their economic problems in real time.

2.0 Biased Equilibrium

In this new model, the fundamental assumption is that information is no longer a given parameter but a strategic tool that individual economic agent uses with others in his or her economic or social matters (Zaman, 2009). Although the path of capitalists synthesis is marked with many adjustments, at very molecular level there exists equilibrium between information sharing strategies of individual economic agents and their payoff functions. Any economic achievement and challenge are fundamentally rooted in this information sharing equilibrium.

There could be two types of scenarios of information sharing strategies be used to analyze an equilibrium. One is perfect information sharing strategy and the other is imperfect or asymmetric information sharing strategy. The concept of perfect information between two individual economic agents X and Y is explained in Figure 1 in a simple Game Theory model (Zaman, 2012a). Let f is the payoff profiles of respective strategies. If X takes 'High' strategy to share information with Y and on the other hand, Y takes conservative ('Low') strategy, then the corresponding payoffs of X and Y will be $f(X_H)$ and $f(Y_L)$ respectively. If we assume that both of them have perfect information about the all possibilities of the game, then one will expect that

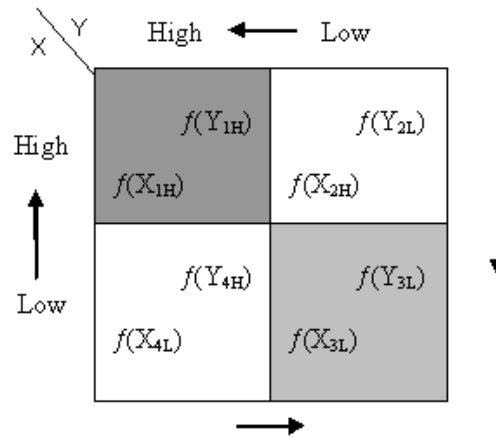


Figure 1: equilibrium in case of equal sharing of information

that his opponent will follow the same strategy and the game will produce a win-win outcome. The outcome of this game is two Nash Equilibriums (Nash, 1951) where they choose the same combinations of strategies either (high, high) or (low, low) and no unilateral deviation in strategy is profitable. In this situation, theoretically the payoffs are the same for X and Y like either $f(X_H) = f(Y_H)$ or $f(X_L) = f(Y_L)$.

We may apply this outcome to our real world, where X is an employer and Y represents a worker. If the employer and the worker share information equally with each other, the worker will have to be paid equal to his marginal contribution for whatever output he or she produces. However, the marginal contribution is calculated in the other way around. The amount the employers pay the worker, we consider that equals to his marginal contribution for simplification our math. At this point, if we consider that everyone wants to maximize his or her payoffs, then this game will reach to equilibrium at (high, high) or $(f(X_{1H}), f(Y_{1H}))$. In this way we cannot explain how the capitalists are created in the world or how they have gathered their capitals from their once zero ownership (technology is not considered). Similarly the “perfect information” concept fails to explain the empirical behaviors of an economy as a whole. In our real world, although individuals share information in any combinations, the outcome of information sharing can be either ‘win-win’ or ‘win-lose’. In case of win-win outcome for a group of individuals among many individuals in an economic game, we may abstract them as a ‘virtual coalition’ relative to the others (Zaman, 2009).⁵ The individuals in the coalition are assumed to share the same

level of information with their peers and hold the same level of rationality or preferences. The term information asymmetry used in micro-economics that explains a situation of a transaction where one party has superior information compared to another. If the information sharing is imperfect, one will try to dominate over the other. This happens when two or more individuals actively or passively form a ‘virtual coalition’ relative to the other and try to dominate.

In our previous example, it can be considered that X and Y constitute a virtual coalition A1 to achieve higher payoff than any other individual outside their coalition as shown in Figure 2 below. If there is another individual economic agent Z (pay-off function $f(Z)$) who is outside the virtual coalition A1, there will be two possibilities for him. Z may either merge with A1 or compete with X and Y. The possibility of merging depends on whether the win-win characteristic of coalition A1 will be undistorted after the merging or not. Therefore, merging decision largely depends on coalition A1 and requires equal sharing of information that eventually leads to an efficient equilibrium. In the other case, as a member of a virtual coalition,

		Z	
		High	Low
A1(X,Y)	High	$f(Z_{1H})$ $f(A1_{1H})$	$f(Z_{1L})$ $f(A1_{2H})$
	Low	$f(Z_{4H})$ $f(A1_{4L})$	$f(Z_{3L})$ $f(A1_{3L})$

Figure 2: Biased Equilibrium⁸

X and Y may share information with Z in a way whatever strategy Z takes (high or low) X or Y receives higher payoff than that of Z. That is $f(X_{4L})$ or $f(Y_{4L}) > f(Z_{4H})$ and $f(X_{3L})$ or $f(Y_{3L}) > f(Z_{3L})$. Here, Z's rational decision will be to choose the one whichever make his or her payoff locally efficient. If $f(Z_{4H})$ is always greater than $f(Z_{3L})$, this game will reach equilibrium at A1= 'Low' and Z= 'High' position where

($f(X_{4L})$ or $f(Y_{4L}) > f(Z_{4H})$). We may call this situation as “**Biased Equilibrium (BE)**”⁵ (Zaman, 2012a). Here X or Y can be called as **Biasing Source (BS)** and Z as **Biased Load (BL)**. A biasing is a strategic decision of Biasing Source and rational decision of Biased Load under a biasing framework.

Let us further assume X, Y and Z have started with equal amount of property rights or capital. They would therefore have an equal amount of payoff, say ‘M’ in case of efficient equilibrium. However, in this particular case here, Z receives less payoff than that he or she would receive in case of efficient equilibrium and the difference goes to A1 that is to be distributed between X and Y. That is, $f(Z_H) < M$ and $f(X_L)$ or $f(Y_L) > M$. The difference $M - f(Z_H)$ goes to the coalition A1, which is to be distributed between X and Y. Here Z represents one of the many individuals who have to compete with a coalition for their economic needs. Ideally, X and Y do not allow many individuals to share their gains but will continue to playing the similar game with more and more individuals on the other side. This is how, a capitalist economy or market economy works and resources are agglomerated in the hand of few people (Zaman, 2010). The term capitalism, in its modern sense, is often attributed to Karl Marx.⁹ As Marx (1859) explains, in work-wage bargains derives from the fact that employers pay their workers less in "exchange value" than the workers produce in "use value". The difference makes up the capitalist's profit, or in Marx's (1869) terminology, "surplus value". “Therefore” says Marx, “capitalism is a system of exploitation”. Nevertheless at the same time, capitalism is also a system of progress when it works with market power for distribution of resources.

This simple biasing model actually fulfils two perspectives of an economy:

1. Institutional Perspective
2. Market Perspective

3.0 Institutional Perspective of Biased Equilibrium

The above example also shows that the problem of information asymmetry has evolved from the time dimension that economists often ignore. We have assumed that X and Y have superior information compared to that of Z since Z appears late to play the game. The individuals who are already positioned in a virtual coalition are also probabilistically apart from each other in time and context perspective. If Z had appeared earlier than Y, then Z would have taken the position of Y and vice versa. It is hard to break an existing coalition since it consolidates more as the game continues.

Neoclassical economics portrays human beings as “consistently rational and narrowly self-interested agents who usually pursue their subjectively-defined ends optimally (Tregarthen & Rittenberg, 2000).” A behavior is considered as rational if it is goal-oriented, evaluative and consistent. This stereotypical human, often referred to as “Homo Economicus (HE)”. In his Forbes magazine article Peter Ubel (2014) describes this as “a creature of coldly calculated selfishness, dispassionately maximizing its best interests even if that comes at the expense of others.” “In other words” as he further describes “Homo Economicus is the prototypical member of the social and economic elite (Ubel, 2014)” We have learned from a study in Japan that a very small portion of the population qualify as Homo Economicus who want to maximize self-interest without regards for others. The study also discovered that another small portion were quasi-HE (qHE) who cared little for well-beings for others. A quarter of the people consistently showed regards for others, which they called Consistent Cooperators (CC) and the majority of the people were in the middle, who showed random or impulsive behavior were called Ordinary People (ORD).

Let imagine a micro model of economy of two economic agents in an economy, A and B, whose Homo Economicus (HE) property have only two variations, either “High” or “Low” as shown in the below Figure 3. If both of them are at "High" HE, their narrow self-interests for grabbing more wealth will potentially put them in a confronting position and no market will develop or the economy will not progress. Similarly, if both of them are at "Low" HE states, distribution will happen socially and therefore, the economy will produce no private capital. Both the scenarios do not tell our present day economy evolved. To represent the very fundamental of a realistic economy, they should have different HE values or states. For instance, if A is at

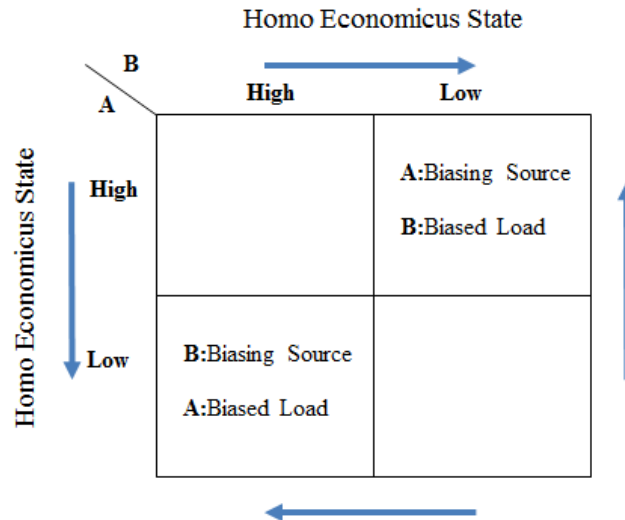


Figure 3: Homo Economicus Biasing

“High” HE state, while B is at “Low” HE state, A will act as biasing source and B as biased load for an economic transaction to work. The biasing source A has higher HE profile than the biased load B, where “HE profile” is a combination of HE value and position on the biasing chain. Here biasing is a strategic decision for A. And for B, it’s a rational decision under a biased equilibrium framework. Biasing is not about constraints but also it can create opportunities in its own way as long as the fundamentals of biasing are valid, where it must be comprised of strategic and rational components and it must better off the biasing source over the biased load. One biasing may also create grounds for another biasing. As an example, readymade garments industry is one of the strategic decisions of Bangladeshi entrepreneurs. On the other hand, finding jobs in garments industries leaving rural households are rational decisions of garments workers under their impoverished economic circumstances, created by another sorts of biasing. Now the readymade garments sector in Bangladesh is the second largest in the world.

This model can explain historical evolution of institutions. As an example, in history, either in ancient Egypt or in middle age Europe, the two kingdoms fought with each other either to make the defeated nations slaves (Figure 4 (a)) or acquire lands (Figure 4 (b)). It is also valid for explaining a feudal economy, colonization or even a socialist economy. The colonists had higher HE value than the natives. In the diagram below, a feudal lord, or a colonist can be represented as A and a serf or a native as B. Once a feudal system or colonization is established, then the feudal lords or the colonists had

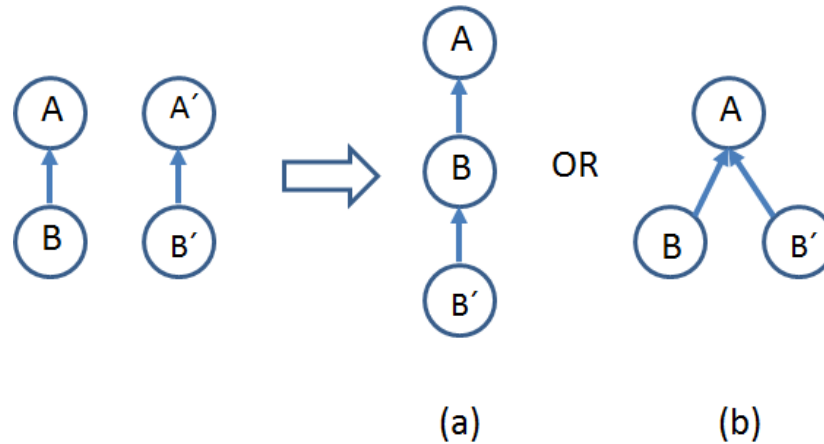


Figure 4: Fundamental of Institutional Formation

to maintain a high HE profiles (value and position) over the serfs or the natives. In a socialist economy, government represents A and the people represent B. Although many analysts may disagree that a socialist or communist government have the similar characteristics to a capitalist elite such as narrow self-interest and domination but it acquires full control of the economy that empower it for mass production of weapons, launching wars, invading countries to promote businesses or ideologies for economic expansion.

Now let imagine, Bs are laborers with “Low” HE profile. And A, A¹, A²..... Aⁿ are entrepreneurs with “High” HE profile who strategically align resources and create incentives for technological innovations. In this model, if they can make differences on achieving those objectives, they can be represented as separate biasing chains as shown in Figure 5 below. In the long run, whoever is on the upper positions of the

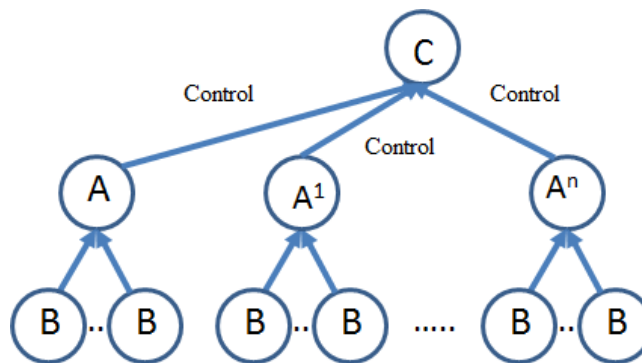


Figure 5: Institutional Perspective of Biased Equilibrium

biasing chains consolidate their control with every downward extension happens over time. This is the essence of institutional evolution and therefore, represents **Institutional Perspective** of an economy. The more they consolidate their control, the higher HE profile they gain. In this simple model, economic agent C consolidates the control over the biasing chains below and therefore, it has the highest HE profile. This explains how elite financial power houses virtually control our economies.

Most of the people born with a certain position and therefore in the middle of a biasing chain. This means they don't need to apply deliberate strategies to take the position. This is much of a characteristics of majority of the people, who shows casual or random HE behavior but on a certain position. Japan test defined them as Ordinary People (ORD). Nevertheless, rational economic agent wants to go down of the biasing chain rather wants to go up from there.

Capitalists' are economic agents with very high HE profile. Quigley (1966) defines capitalism as "an economic system motivated by the pursuit of profits within a price system".⁵¹ He differentiates different types of capitalists as:

"The commercial capitalists sought profits from the exchange of goods, the industrial capitalists sought profits from the manufacture of goods; the financial capitalists sought profits from the manipulation of claims on money."

In my book "Economics of Information Biasing", I explained that capitalist institutions were fundamentally born in information sharing strategies of individual economic agents (Zaman, 2010). The biasing of information integrates diversified payoff maximization interests, one dependent on another but segregates the individuals in different coalitions. A social or economic problem can be subjectively modeled as an information biasing chain (Zaman, 2010) where individuals are positioned in different abstract coalitions according to interdependence of their payoff functions as shown in Figure 6. The upper layer coalitions virtually control the institutions and they have greater influences on our economy. The whole biasing chain represents a **Values Framework (VF)**, where each coalition holds certain Homo Economicus (HE) profile of present time. We may consider each country has unique VF that translates the economic cost and output produced in the country into human cost and human value respectively at each level of the biasing chain. The VF

of the entire world evaluates our economic efforts in terms of benefits of whole mankind. Institutional framework is just an outfit of the values framework.

At the beginning the global integration of biasing chain happened by hooking up local HE biasing sources that have been historically present there. An influential country can be modeled as biasing source that creates policies for competitive business environment for corporations within the country, while helping them to internalize profits and externalize costs outside (Bakan, 2008). This means, the political influence of the country focus on the benefits of the corporations it is hosting not the benefit of human being at large. Similarly, the corporations can also work as biasing source within the country that not necessarily be supportive for the wellbeing of the people of the country but for benefits of their stakeholders. There are biasing present among stakeholders too. As an example, big stakeholders may bias small stakeholders by cooperating with their similarly HE peers of the same or different corporations in the same of different countries. The modeling of all these depends on what we are intending to analyze.

To simplify we may assume every biasing chain model has a **Universal Biasing Source (UBS)** and an **Absolute Biased Load (ABL)**. An ABL is a Pareto Space (PS) and it has no biased load down (Zaman, 2010). In the biasing chain model below, A_0 , A_1 , A_2 ,.....are subsequent biasing sources/biased loads and whereas A_N is the ABL. A chain of biasing sources prevents or slow down any reform of our capitalist establishments. However, rival capitalists may engage themselves in war or invasion

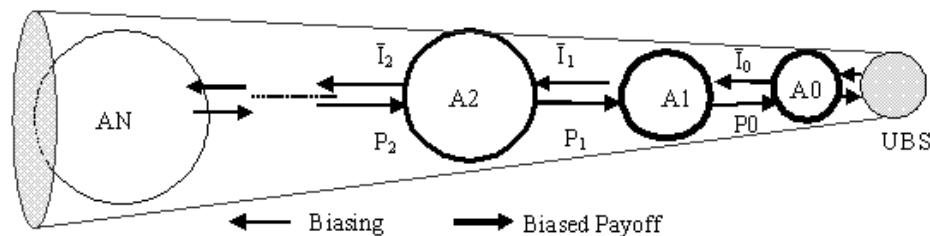


Figure 6: Information biasing chain

and creates grounds for reshuffling the biasing chain in the middle. Sometimes religions are used as banner for their institutional control. History tells that if a

religion goes against the establishments, it was also attacked. Fostering wars or selling weapons while people are in need of food, shelter and care are noting but manifestation of the VF of the global institutions. Eventually whoever moves or remains on the top consolidates their controls and might. This is the essence of capitalist synthesis over the years.

Quigley (1966) also describes our civilization has passed through a series of phases or ages. He defines three ages of civilization, The Age of Expansion, Age of Conflict and Age of Universal Empire.¹ Our existing phase can be treated as the Age of Universal Financial Empire under capitalism, which is only less than forty (40) years old, whereas capitalism is about three hundred (300) years old. The people who control the financial empire from the top most position of UBS have the highest HE profile. This means they have outmost concern about their little circle even at the expense of others outside. Since our capitalist VF are greatly influenced by them, in my book “Green the Capitalists”, I called them the “Core Capitalists” (Zaman, 2016).

The following figure (Figure 7) shows a simple cone shaped information biasing chain model as but comprising of only one Biasing Source (BS), one Biased Load (BL) between the Universal Biasing Source (UBS) and the Absolute Biased Load (ABL). An economic system is an interdependent process by involving many individuals and coalitions. We may imagine that the information biasing system is a **Biased Learning Process (BLP)** occurs in vertical direction from biasing source to biased load. There is also a feedback process flows opposite direction from a biased load to a biasing source and all the way up to UBS. The feedbacks are captured by the biasing sources to make necessary corrections and adjustments to have better control over others all the way down the chain. Therefore, the feedback process is in fact a learning process for all the biasing sources. In a biasing chain model, since this learning occurs in the vertical direction, it can be named as **Vertical Feedback Process (VFP)** as shown in Figure 7 (Zaman, 2016). BLP and VFP together can be called as **Biased Vertical Learning Process (BVLP)**. There are also incentives for learning within a coalition that leads to consistent development of mental models of the individuals and changes in the institutional structure of an economy within it. This learning can be named as Horizontal Learning Process (HLP) or endogenous learning. The horizontal learning describes natural human learning processes within a coalition.

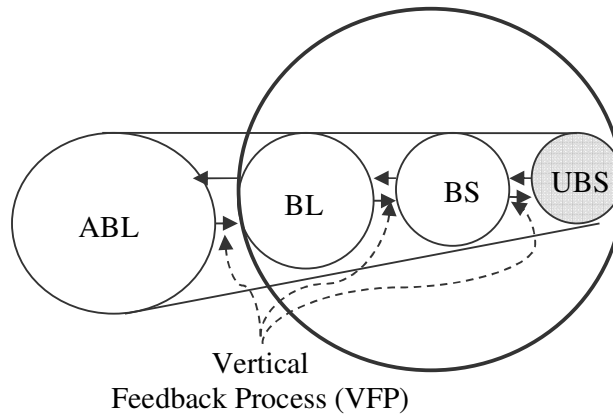


Figure 7: Biased Vertical Learning Process (BVLP)

Although every individual within a coalition share the same level of information but learning is different because each individual has different knack and ability for learning. North (1994) defined the learning process as “the informational feedback process and arbitrating actors will correct initially incorrect models, punish deviant behavior and lead surviving players to correct models.”³⁴ North (1994) defines a general learning process. If we try to fit this definition into our model, it will be much of a horizontal learning as the arbitrating actors are peers positioned in the same coalition. On the other hand, it will be more of a BVLP if they are positioned in two different coalitions. If knowledge development is a HLP, then BVLP will tell about how is to use that knowledge. For example, gun powder is result of horizontal learning but to use gun powder for colonization is result of BVLP (Zaman, 2010). The ways our economic world functions like technology, specialization, division of labor, competition are the results of combination of both the types of the learning processes. Since policy making is a top down process, vertical learning should worth outmost importance to economists and social scientists. It also explains evolution of our institutions with time.

4.0 Market Perspective of Biased Equilibrium

Institutional perspective of Biased Equilibrium does not explain the market dynamics of our economies observed following industrial revolutions. The industrial revolution in the 19th century allowed ‘better off the poor people through employment without worse off the riches’ – the term called Pareto improvement, introduced by Vilfredo Pareto (1848–1923). In one of my previous articles, I introduced the concepts of **Pareto Coalition (PC)** and **Pareto Space (PS)** derived from the concept of Pareto improvement—the same origin of general equilibrium (Zaman, 2012a).

Considering the fact of the presence of favorable institutions and their influences, probability of achieving Pareto efficiency for a part of the population is higher than the whole population. Therefore, following neoclassical economics, it can also be imagined that the assumptions of the fundamental welfare theorems are valid for that part of the population but are not valid in general. That is, there exist perfect information sharing, perfect competition, complete set of markets and no enforcement problem within them. I named this part as a **Pareto Efficient Coalition (PEC)** (Zaman, 2009) or **Pareto Coalition (PC)** (Zaman, 2012a). The PEC is an analytical abstraction where the concept of methodological individualism is valid and every individual share the benefits of development with each other in a defined manner without any further institutional intervention. On the other hand, the welfare is yet to achieve for the remaining population. I named the remaining part as a **Pareto Improvement Space** (Zaman, 2009) (**PIS**) or **Pareto Space (PS)** (Zaman, 2012a). They are separated by a **Biased Equilibrium Barrier (BEB)** in a way that within a PC, institutions presumably do not matter, but when PC interacts with PS, institutions do matter (Zaman, 2012a).

In economic literatures, the concept of coalition only involves active individuals who cooperate each other to achieve a common goal. At micro-level, the origin of the **PC** essentially involved active people only who wants to better off themselves without caring the others are worse off or not. Following the path of economic history, particularly with the “surplus value” created after industrial revolution and availability of cheap energy, the biasing has been extended by establishing institutions at the macro level and involved passive ordinary individuals who have rational interest to better off themselves but no deliberate intention to worse off or dominate the others.

A biasing framework also defines the opportunity freedom offered for the individuals within this framework to fulfill their demands. The average capability of a market to fulfill the demands of an individual can be defined as “**Market Energy (ME)**” (Zaman, 2009). The less the biasing, the more the market energy since it provides more freedom for making rational decisions. Following the previous example, mainstream economists would imagine A, B and C are part of the same market (Figure 2.6a). However, from the concept of ME, it makes much sense to imagine

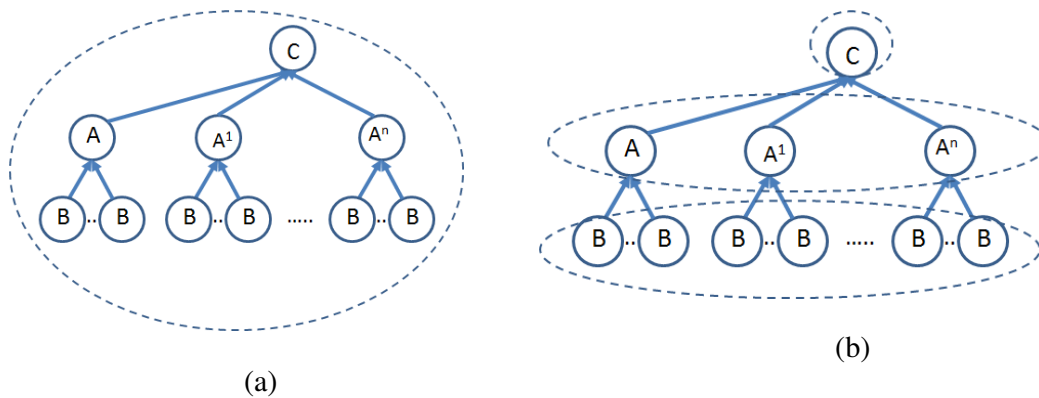


Figure 8: Market Perspective of Biased Equilibrium

that Bs are part of one big market with lower market energy and As, C are part of a smaller market with higher market energy (Figure 2.6b). The concept of market energy constitutes **Market Perspective** of Biased Equilibrium.

In my other previous articles the concept of Biased Equilibrium was further enhanced to describe a “**Differential Market Model (DMM)**” (Zaman, 2010) that our market is not uniform but distributed in layers of “**Market Energy States (MES)**” (Zaman, 2009). It also shows that in real world economy, the probability of achieving Pareto efficiency decreases down along the MESs (Figure 9). The market perspective views economic agents as consumers and service providers at the same time. The consumers at lower market energy states are rationally attracted to higher MESs because of better opportunity freedom but institutional constraints keep them separate. On the other hand, the economic agents on lower MES face more competition among peers to offer services to upper MES than otherwise do. In a DMM, the difference in market energy levels is the fundamental of capital flow and businesses. Services offered by upper MES is more expensive than the services offered by lower MES. As an example,

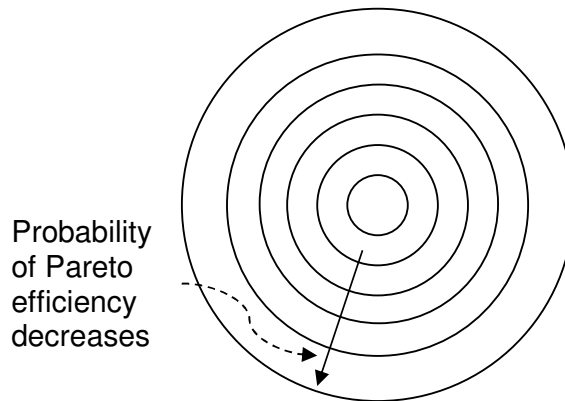


Figure 9: Differential Market Model (DMM)

farmers in lower MES can sell their produce in higher MES in a greater price. However, when they go for services from a lawyer or a doctor is more expensive. That's why the differential money always goes upward.

Essentially when we talk about MES, we not necessarily consider the same set of products. However, we may assume the following two things about product set:

1. The product set for lower MES is a subset of higher MES. This proposition can be called as 'Subset Proposition of Consumption (SPC)' (Zaman, 2012a).
2. The individuals around the boundary of BEB vie for the same set of products. This propensity can be called as the '**Border Propensity of Consumption (BPC)**' (Zaman, 2016). Marketing is kind of information biasing that induces BPC. It has a radiating effect all over the economy.

The above two assumptions help us understand the fact of price equilibrium of a particular product available in multiple market energy states of an economy. As an example, let us imagine that there are three market energy states in a DMM. Figure 10 shows demand curves D_1D_1' , D_2D_2' and D_3D_3' and supply curves S_1S_1' , S_2S_2' and S_3S_3' for a particular product for three market energy states, 1, 2 & 3 respectively. Although the economy is distributed in different market energy states but there can be just one equilibrium price 'p'. The first assumption tells that here we are talking about a very essential product that has demand in all three markets. We can also apply the concept of BPC for its micro-economic analysis of price equilibrium involving two market energy states. A radiating effect of BPC can explain why we see increase in real estate

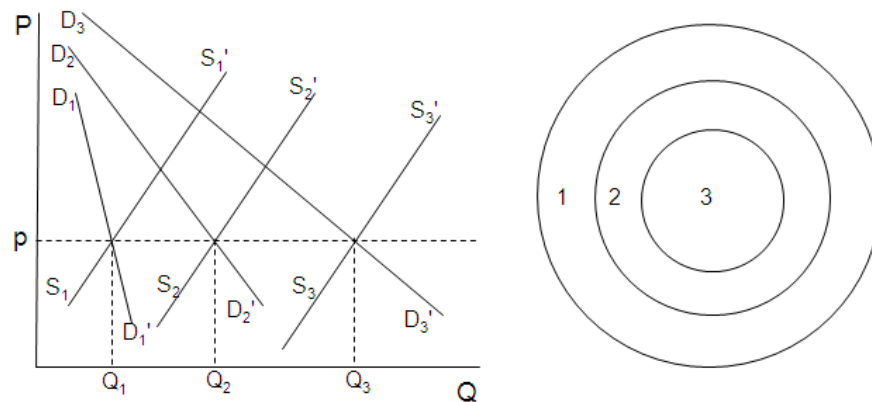


Figure 10: Price Equilibrium in DMM

price in rich residential areas also increase price of the tiny hutments in urban slums. In a DMM, the difference in market energy levels is the fundamental of capital flow and businesses. As an example, farmers in lower MES can sell their produce in higher MES in a greater price.

My previous articles also introduced the concept “**Money Market Dynamics (MMD)**” (Zaman, 2010) describes a process where differential Money (M) is being accumulated toward an imaginary center of a DMM from where it is converted into Market Dynamics (MD) and gains potential to centrifugally spread down creating new opportunities, better skill, jobs and products and services with resized prices and better qualities over time. The term “money” here can be called as “**Potential Market Energy (PME)**” and “market dynamics” as “**Kinetic Market Energy (KME)**” (Zaman, 2016). Although these conversions happens in both ways at every point of point of a DMM but for simplicity we may consider that a certain MES has the same level of market energy at its every point. In a broader perspective, we see there are two opposing forces, accumulation property of capital and distribution property of market. If this mechanism works perfectly as matching with mainstream economic theories, any small disturbance will be automatically counteracted and corrected by the system itself without any institutional involvement.

There are few more points to be noted about real life MMD. Firstly, MMD represents a fully contributive economy but not necessarily fully employed. This means there are differentiation among quality of employments. Secondly, in an ideal economy having

local market only, entrepreneurs take the challenge to bear high wages and at the same time achieve good profit. Therefore, they diversify their investments and adopt new technologies, which create new jobs and increases productivity per labor. Thirdly, in a global MMD, the global entrepreneurs exploit low wage wages of developing countries to generate high profit. Fourthly, a complete cycle of MMD results in accumulation of capital in the form of profit or surplus payroll for employees, which is also the source of income of a government in the form of tax. Fifthly, it supports Minsky's (1992) statement that money is connected with market dynamics through time. In case technological state is changed, the money an individual spends and the products and services he or she receives are not exactly "goods for goods". MMD tells that ideally he or she should receive better values over time because of technological advancement. Sixthly, conversion of PME to KME also depends on institutional complexities of our world.

In a DMM, each MES has its own demand and supply pattern. However, as per definition of MMD, part of the PME accumulated in the economy must be converted into KME for development and prosperity. A technological shift produces products for a larger market each time, stretching from upper MES toward lower MESs. This attribute of a specific technology can be called as '**Transformation Potential of a Technology (TPT)**' (Zaman, 2016). The present digital revolution is firmly rooted in silicon technology which has a high TPT value. A technology with high TPT causes more production and consumption of the products (e.g., electronics, plastic, aluminum and glass products), which eventually corresponds to more use of energy and more accumulation of capital toward the upper MESs.

Under BE, competition on the upper MESs among comparatively smaller population (economic agents) creates stronger upward agglomeration property of money (PME) than downward distribution property (KME) of market. This phenomenon creates a **Money Loop (ML)** (Zaman, 2012a). The middle MESs are where consumptions mostly happens in an economy, that is PME and KME are better balanced. The term "market dynamics" or KME refers to competition for production and consumptions. However, in presence of BE, it may prevent "market dynamics" from expansion beyond a certain MESs but within themselves and thus it creates **Market Energy Loop (MEL)** (Zaman, 2016). Ideally it expands through generating employments.

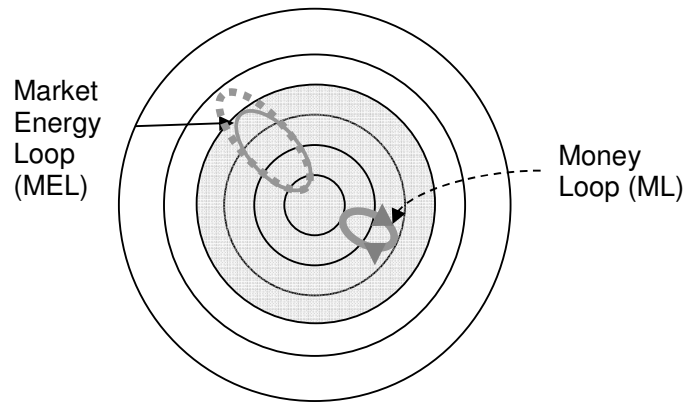


Figure 11: Market Energy Loop and Market Loop

Corporates creates MEL by integrating people and resources as long as they can internalize profits and externalize cost burdens to local economies and environments.

Although an economy has multiple MELs but we are mostly concerned about the MEL that corresponds to the largest possible perceived PC of the economy with certain conditions and circumstances such as availability of certain level of TPT, knowledge and resources. This discretionary MEL can be called as **Optimal Market Energy Loop (OMEL)**. The largest perceived PC can be called as **Final Pareto Coalition (FPC)** and the corresponding Pareto Space as **Final Pareto Space (FPS)**. The Biased Equilibrium Barrier (BEB) that encloses the FPC can be called as '**Final BEB (FBEB)**'. The market correspond to EPC can be called as "**Dominating Market Energy State (DMS)**" And the market correspond to EPS can be called as "**Residual Market Energy State (RMS)**" (Zaman, 2016). One big reason of poverty of an economy is burgeoning middle layer surrounding FBEB, where the differential money created from the difference in market energy levels is diffused.

An expansion of ML such as through speculation can be considered as "**Vertical Growth (VG)**" (Figure 12a), which increases inequalities of an economy (Zaman, 2012a). On the other hand, expansion of market dynamics (KME) toward RMS can be considered as "**Horizontal Growth (HG)**", which decreases inequalities of an economy (Zaman, 2016). An absolute horizontal growth provides no incentives for the capitalists for re-investment. It can be assumed that there is a phase shift $\angle\alpha$ of market energy from its ideal horizontal position, which creates MEL as shown in Figure 12. This phase difference $\angle\alpha$ can be called as **Market Skewness Factor**

(MSF) (Zaman, 2016). In a DMM, the higher the position of MES, the more the MSF is tilted toward vertical direction, therefore, causes VG. And the lower the position of

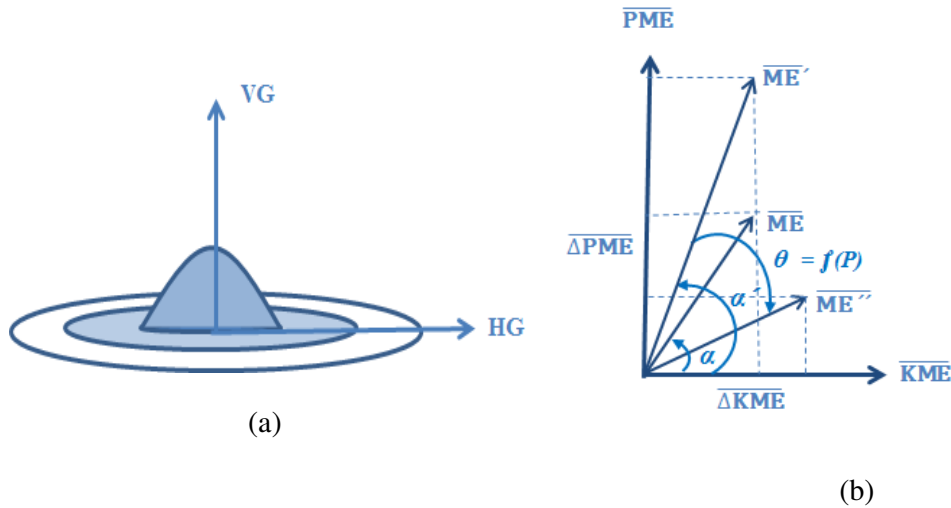


Figure 12: Horizontal Growth (HG) and Vertical Growth (VG)

MES, the more the MSF is tilted toward horizontal direction, therefore, causes HG. If an economy has OMEL more inclined toward vertical direction, economic policies such as progressive taxes, increase competition, allowing unions, social welfare are required to move the MSF down toward HG. Let $\angle\theta$ denotes the effect of economic policies for reduction of MSF. Here $\angle\theta$ can be called as **Economic Policy Factor (EPF)** (Zaman, 2016). The intensity of OMEL decreases with reduction of MSF, as it moves toward RMS with the same amount of resources, which provides less incentives (say, less return on investment) for the capitalists. As explained in Figure 12 (b) that because of ML, Market Energy increases from ME to ME' and MSF increases from α to α' but KME remains the same. In this situation, economic policy intervention increases Market Energy from ME' to ME'' toward horizontal direction that is toward more KME. The main idea is to bring money out of the ML to the production system so that the people in DMS and in RMS are also benefited. However, in real world economic policies are either supply-side or demand side, reinforce MEL.

If previous economic policies have decreased MSF, new policies are taken to move EPF $\angle\theta$ to the opposite direction (anticlockwise) that it reinforces MEL as happened

after Reagan's tax cut for riches in 1981. Then the next economic policy to move EPF to clockwise direction, which may also reinforce MEL but toward horizontal direction. In both ways, the economic growth continues. Alternatively, debt can reinforce OMEL as long as the country has control over resources. In this way, expansion of OMEL does not reduce MSF. As an example, if someone buys a house on cash, it means his money (PME) is converted into market dynamics (KME). On the other hand, if he buys in credit, it will convert ML into MEL and vice versa. The MEL will expand as long as the credit is available. Therefore, the relationship between ML and MEL can be controlled by monetary and fiscal policies which eventually create a growth compulsion, while adding vulnerability for financial crisis and recession. Minsky (1992) defined debt based growth compulsion as "paradox of gluttony" According to Minsky, financial expansion leads to a self-reinforcing cycle of economic expansion through debt creation, which eventually collapse.⁸⁷

According to this model, the best way to reduce MSF is to focus on information sharing between DMS and RMS in economic policies. If government policies do not support this objective, the monetary and financial policies whether seen as supply-side economic policies or demand-side economic policies cannot be synchronized. As an example, supply-side economic policies such as lowering the barriers for trade of goods and services can be synchronized with increased tax rates for the riches (capitalists) to build infrastructures, social security for the poor in RMS. In real life we see supply-side economics is implemented by lowering tax rates for the riches, which leaves the government dependent on debt largely to be paid by the employed poor and middle class people from their payroll. As an example, following implementation of Ronald Reagan's supply side economics and corporate tax cut, the current (April 19, 2018 10:31 AM) U.S. federal debt rose from \$998 billion to total \$21.14 Trillion and growing faster than GDP, which is \$64,548 per citizen and \$174,190 per tax payer (Source: <http://www.usdebtclock.org/>). It has already entered to Minsky's speculative realm of financing, where the survival of the economy depends on rolling over debts by using increased amount of physical and energy resources until collapse.

5.0 Inflation and Unemployment under Biased Equilibrium

Now there are three ways in front of the U.S. government to address the massive debt other than default. 1. Cutting expenditure 2. Raising taxes 3. Creating inflation. The first option will have direct impact on job creation, health care, social security, pension, defense and infrastructure maintenance. Instead of reducing expenses, in his recent budget President Donald Trump boosted spending on military, infrastructure and a wall along the Mexican border. He approved a one-year \$1.3 trillion spending bill, which includes \$686 billion to the military and \$591 billion to domestic agencies. Including interest, this bill will add \$1.7 trillion to the federal debt over 10 years, and the national debt will hit \$29.9 trillion by 2028 (Newman, 2018). On the other hand, in the recent "Tax Cuts and Jobs Act", he already slashed corporate tax forever, leaving only door open is raising personal income tax. This is be very similar to the situation that ended Roman Empire when the Empire needed more money to maintain its huge military for keeping the vast territories it conquered but landed elites were exempt from taxation and therefore, the Empire required even more exactions upon those who could not escape taxation. This means the only option is left now is to create inflation. Therefore, this is very important to understand the term "inflation" from the perspective of Biased Equilibrium.

In economics text book, inflation is a rise in the general level of prices of goods and services in an economy over a period of time. It is attributed to changes in real demand for goods and services, or changes in available supplies such as during scarcities, as well as to growth in the money supply for overall economy.⁵⁰ According to concept of BE, inflation in an economy can be defined as any gap or delay between conversion of money to market dynamics or in other words, ML to MEL in the economy. At certain high level of inequality, a MEL creates **Price Pressure (PP)** on lower MES (Zaman, 2016). Accordingly, the OMEL creates PP on RMS. PP is technically different from 'inflation'. The term "Price Pressure (PP)" can be defined as reduction of affordability of the people in lower MES or RMS for buying goods and services because of price increase of those goods and services in upper MESs. As an example, according to Amartya Sen (1981) (Sachs, 1998), Bengal famine was caused by an urban economic boom that raised food prices, thereby causing millions of rural workers to starve to death when their wages did not keep up.

A PP is a negative externality that transmits to people in lower MESs who are not directly involved in a transaction. Poverty is an example of PP of rapid urbanization.

The reason for inflation can be explained in this model by slowing down capital to market dynamics conversion process, which increases the money supply in the economy. Therefore, according to this model, inflation and increase in money supply both are effects of the same cause. However, the early monetarists suggested increasing money supply to boost up consumption, but that actually aggravated the inflation situation. On the other hand, reducing money supply to combat inflation has negative impact on economic growth. As an example, GDP of British economy reduced after Margaret Thatcher increased interest rates to slow the money supply and thus to lower inflation at the beginning of her government (Childs, 2006). However, fiscal policies such as reducing marginal tax rate and tariff, deregulation and privatization have worked to control unemployment and inflation in cases where capital to market dynamics conversion was backed by digital and semiconductor technology revolutions along with increased supply of energy.

Following the previous example of Figure 8, for simplicity, let's imagine that C and As and Bs are part of the same Pareto Coalition leaving Ds in Pareto Space as shown in Figure 13. Although Ds contribute for the economy but their contribution is lowly valued as if they are unemployed. Within the PC, market mechanism works fine since

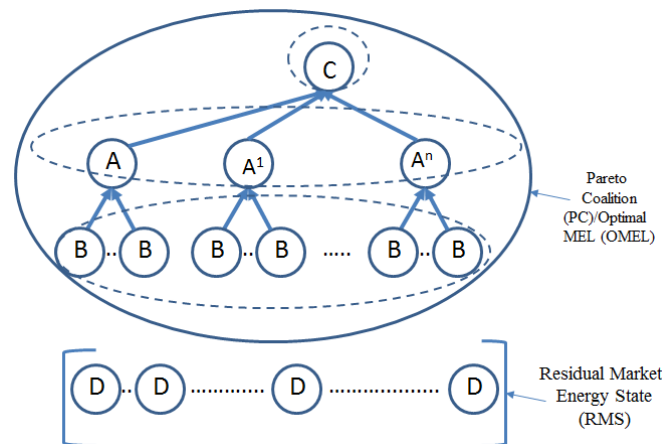


Figure 13: Pareto Coalition and Pareto Space

if costs of living, education and health care all are getting high, their incomes will also keep the pace and the economy will grow. In other words, much of conditions of the

fundamental welfare theorem works here very well, provided that there is enough resources and energy available in the economy. By definition, the MEL corresponds to the PC is an OMEL surrounded by FBEB.

On the other hand, Ds in the RMS are not able to bear the increasing costs of living (Figure 13). To improve this situation, in other words, to include Ds within the Pareto Coalition, we need proper laws and strategies that can break or weaken the FBEB

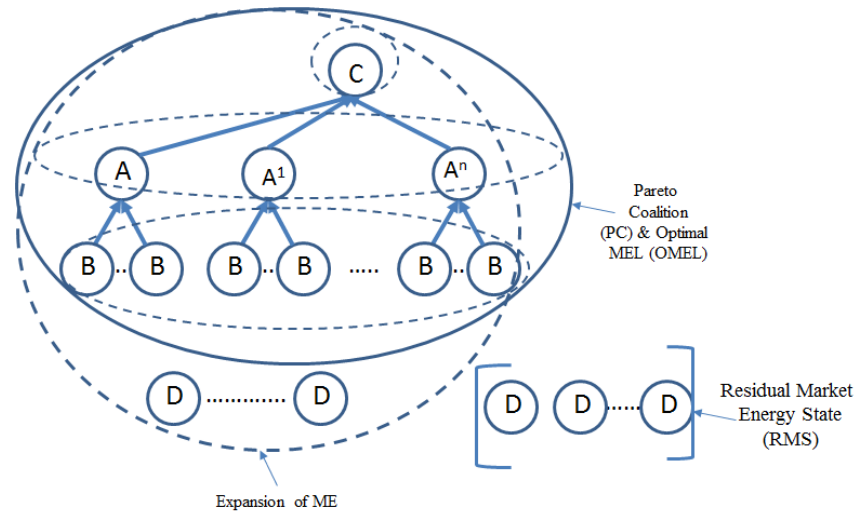


Figure 14: Pareto Coalition and Pareto Space

between them. As an example, government may implement progressive taxes, promote technological innovations and provides welfare and subsidies to increase the market energy of Ds. After that it is expected that then the market mechanism will take care of the rest. However, the fundamental of Biased Equilibrium says that the expansion of Pareto Coalition requires those who are already in there must be better off from this expansion. Accordingly, expansion of market energy through RMS (Figure 14) injects more money into OMEL and any gap or delay between conversion of money to market dynamics creates inflation. Once inflation converts into market dynamics, MEL expands. If that conversion does not happen, inflation sustains but not the market expansion and therefore, the economy may become stagnant.

The concept of biased equilibrium is a market failure approach of economic analysis. Information about scarcity explains the situation why employed workers receive high wages while identical individuals are unemployed (Stiglitz, 2000). Phillips (1958) curve describes a historical inverse relationship between rates of unemployment and

corresponding rates of inflation (Figure 15). This relationship can also be seen from Biased Equilibrium (BE) perspective. Figure 15 shows a Differential Market Model (DMM), where the market corresponds to the PC is shown as M2 and the market corresponds to the PS is shown as M1. Accordingly, from functional point of view, M2 can be considered as OMEL and M1 can be considered as RMS, separated by FBEB. Figure 14a shows initial DMM corresponds to point A on the short run Phillips curve. In this situation, an effort to reduce unemployment through Keynesian

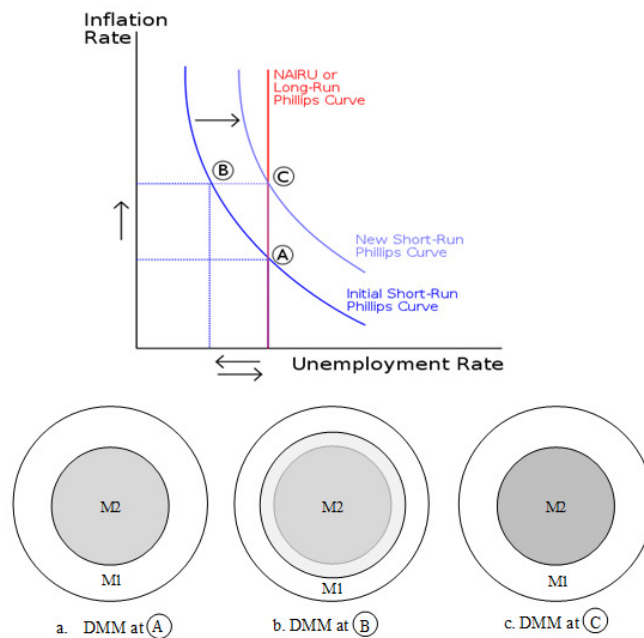


Figure 15: Biased Equilibrium Perspective of Long-Run Phillips Curve

transfer will expand the market energy by creating new jobs and opportunities for RMS around the boundary of the FBEB (Figure 15b). However, according to the definition of BE, much of the benefits of the transfer or job creation will go to OMEL if it cannot create market dynamics. In other words, it will spread inflation within OMEL and increase “Price Pressure (PP)” on those who are in in M1. This is what happens at point B on the Phillips curve.

After a certain point further trying the same policies for reducing unemployment will worsen the inflation situation but cannot generate more employments. Edmund Phelps (1968) and Milton Friedman (1968) explains the short-run trade off will raise inflation expectation that shifts the short-run Phillips curve rightward and moves the

point of equilibrium from B to C, where it will sustain as Non-accelerating Inflation Rate of Unemployment (NAIRU) (Phelps, 1968) representing stagflation. Now the rational expectation of the newly recruited individuals increases. According to the concept of Border Propensity of Consumption (BPC), the individuals at the boundary of the both sides of the BEB vie for the same sets of products and opportunities and therefore, seeks the same sorts of increase of wages. In this way, in a closed economy, it tends to reduce the market differential required for MMD to work but does not create a sustainable employment capacity to accommodate the extended price-wage spiral. Therefore, the economy squeezes back to its 'natural rate' as shown in 13c but the inflation level prevails at point C. The concept of stagflation is a validation of the presence of OMEL in an economy. In a closed economy, if stagflation continues, investment may fall significantly and so as the incomes of the rich people. If differential of market energy levels of a country reduces, the economy will reach close to saturation and growth will slow down. To overcome this situation, many developed countries invite immigrant workers to broaden the market differential or extend the mark horizon by opening up markets for global trade.

Economists such as Friedman (1968) and Phelps (1968) further argue that rational workers would only react to real wages, that is, inflation adjusted wages. Charles Evans (2014), CEO of Federal Reserve Bank of Chicago defines the simple reason for inflation rise “Low unemployment raises worker bargaining power, allowing them to successfully push for higher nominal wages. To protect profits, employers raise prices.” Here I argue that due to Biased Equilibrium (BE), after the price rise, the differential money goes to the OMEL at much higher rate than the wage raise. That is why we see in Figure 16 that in the U.S. economy, wages as a percent of the economy have been falling down regardless any recession. Eventually, the money causing extended inflation is trapped in OMEL keeping the inflation level and corresponding ‘Price Pressure’ high. Edmund Phelps’s definition of NAIRU thus substantiates the concept of Biased Equilibrium and justifies presence of MEL in the U.S. economy.

Another model called ‘Efficiency Wage Hypothesis’ introduced by Alfred Marshall (1920) argues that wages, at least in some markets, could be more than the market clearing wage in order to increase productivity or efficiency.⁷¹ This increased labor productivity pays for the higher wages. Although we the productivities of the workers



Figure 16: Wages as a percent of the GDP (USA)

Source: St. Louis Fed (<http://research.stlouisfed.org/>) [A576RC1/GDP]

have certainly increased after increased introduction of high tech and automation technologies since 1980s but the real wage has been still falling. During this time, lots of migration and foreign skilled workers were added in the U.S economy.

Another model called Shapiro-Stiglitz (1984) model of efficiency wages, the workers are paid at a level that dissuades shirking. The model proposes a Non-Shirking Condition (NSC) which once satisfied avoid workers to incur in shirking. Efficiency wages theory is a market failure explanation of unemployment in contrast to theories which emphasize government intervention such as minimum wages. Alternatively, whenever there is a demand for wage raise among the people in the lower MES (RMS) due to PP, central bank may reduce interest rates for consumer credit market to offset the impact of PP in consumption. Therefore, PP is translated into 'debt pressure' for the individuals who are in the weaker MES. Lowering down interest rate has many benefits: 1. It can be centrally controlled 2. It reduces wage pressure. 3. Simultaneously, it reduces PP and controls inflation, 4. It enhances consumption. Nevertheless, it leads an economy toward debt spiral.

When corporate profits are high, certainly all or part of the corporate employees get share of the pie as bonus or salary raise. However, at the same time there are many

workers whose wages fall over time. Here comes the concept of ‘Biased Equilibrium’ that can separate out the employees who are not able to shirk from those who do when a market fails. Figure 17 shows a modified ‘efficiency wage model’ based on the concept of Biased Equilibrium in a two MES DMM, where M2 represents the MES where NSC is applicable. It is separated by an FBEB from the other market M1

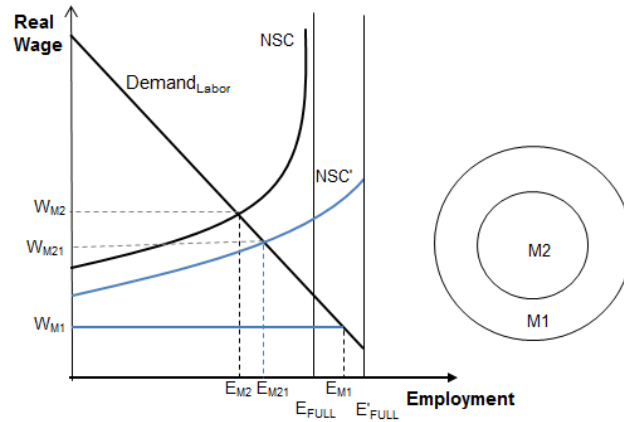


Figure 17: Modified Efficiency wage under Biased Equilibrium

a RMS, where NSC is not applicable since the workers have to work otherwise they will have to starve. In this case, the NSC curve is perfectly wage elastic, as shown in Figure 17 as a horizontal line at certain low wage. It shows that the wage in M1, W_{M1} is lower than the wage in M2, W_{M2} but it solves the stagflation problem of the economy by crossing the full employment point of M2. By summing these two NSC together with their elasticity vectors, the resultant NSC curve is positioned between the two NSC curves shown as NSC' in Figure 17, which shows the economy may achieve a new full employment (E'_{FULL}).

This model has an important policy implication. As an example, if an economy becomes stagnant, it may invite immigrant workers who will not shirk for lower wage, as the second best option for them is to go back to their own country. This explains the reason of the new immigrant law in 1965 to stimulate the American economy. Many Middle East and developed countries have been able to boost their economy based on immigrant workers from developing countries. Similarly, many developing countries especially, China, India and Bangladesh are able to achieve high growth by employing migrant workers from rural areas.

6.0 Globalization to Global Warming

In United States, The rise of income of riches during 1928 eventually ended up in Great Depression. Then from about 1937 to 1947 the income inequality fell, in other words more HG components were added in the economy and market dynamics expanded or penetrated through RMS because of President Roosevelt's policy measures for creating infrastructures, which is called Keynes's demand side economics. However, the post-World War II boom ended in "stagflation" coupled with "peak oil" crisis that slowed down economic growth rate. In the late 1970s, inflation became as high as 10 or 11 percent that caused market interest rates to rise above the limits mandated by regulation Q of Glass-Steagall Act (Carpenter, 2016).

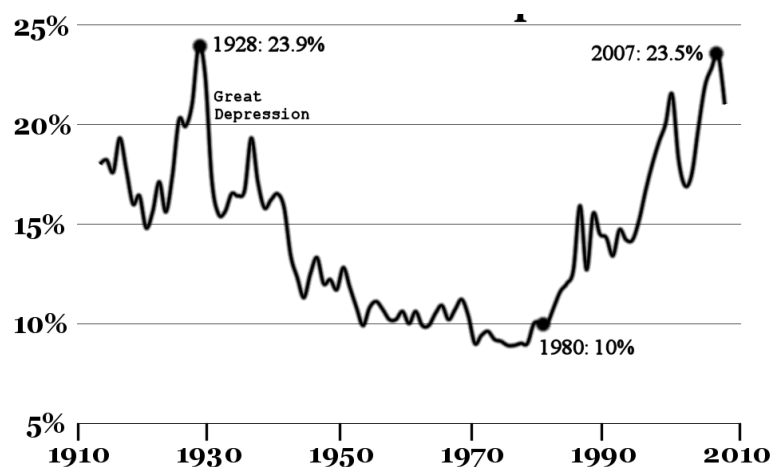


Figure 18: Top 1% income share in USA during the periods from 1910-2010

(Source: Saez and Piketty, 2003)

Following this act, income of top 1% also fell down and became stagnant during the time of stagflation (Saez and Piketty, 2003). Even after the oil deal with Saudi Arabia, 'stagflation' lasted for a decade prior to Ronald Reagan took over the White House (Karaagac, 2000). Political pressure favored stimulus resulting in an expansion of the money supply. Inflation reached to 13.5% in 1981, while the top marginal tax bracket was at or above 70 percent (Noah, 2011). President Ronald Reagan was very much influenced by Arthur Laffer's theoretical taxation model based on the elasticity of tax rates, known as the Laffer curve (Laffer, 2004) as a supply-side economic policy to counteract the stagflation allegedly caused by Keynesian demand-side economic

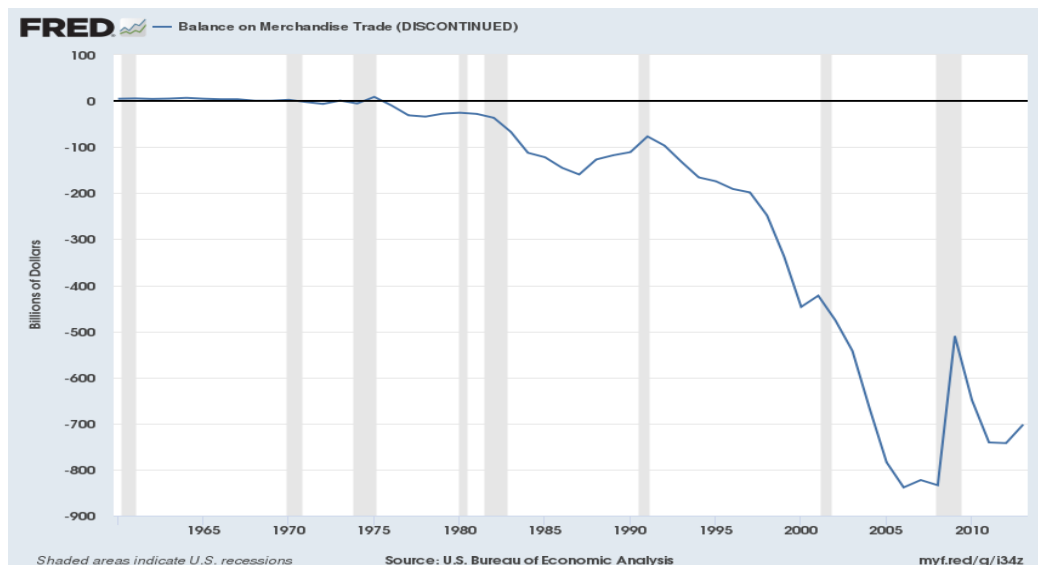


Figure 19: United States Balance of Trade, 1970–2013

(Source: <https://research.stlouisfed.org/fred2/series/BOPBMA/>)

Policy. President Reagan, matching with his previous career in Hollywood, he dramatically dropped the top marginal tax bracket from 70 percent to 50 percent ('The Economic Recovery Tax Act of 1981') and eventually pushed it all the way down to 28 percent (Tax Reform Act of 1986)²² expecting to promote investments (Karaagac, 2000). Interestingly, after reducing taxes for the riches, the U.S. balance on merchandise trade started to fall sharply (Figure 19) instead of rising. This means much of the investments was attracted by quick profit from merchandizing than that from manufacturing, while relative proactivity and demand increased because of massive computerization and digital technology transformation.

The modern foundation of globalization started during Bretton Woods Conference, in which major governments laid down the framework for international monetary policy, commerce, and finance, and the founding of several international institutions intended to facilitate economic growth by lowering trade barriers. The full-fledged version of international trade started following commencement of World Trade Organization (WTO) in 1995 replacing the General Agreement on Tariffs and Trade (GATT), which commenced in 1948. China, to prepare itself to join WTO, it started large scale privatization in 1997 by Deng Xiaoping who promoted the idea "socialism does not mean shared poverty" since 1978 (Yan, 2017). Figure 19 shows the U.S. trade deficit

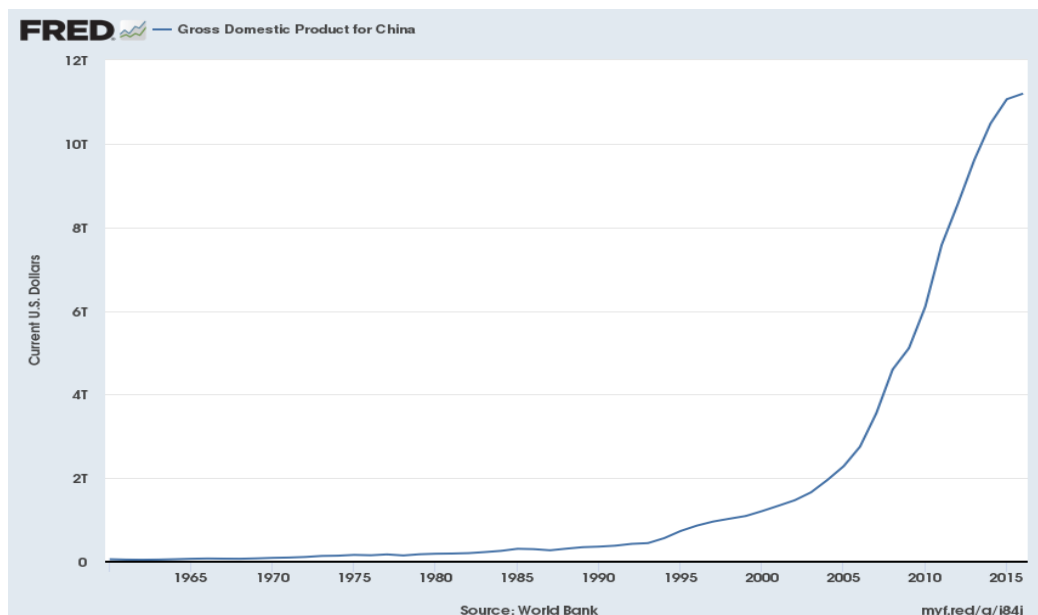


Figure 20: People's Republic of China's GDP between years 1960 to 2014

(Source: <https://research.stlouisfed.org/fred2/series/MKTGDPCNA646NWDB/>)

was almost free fall in 2001, the year China joined WTO. On the other hand, since China joined WTO, GDP of Chinese economy saw exponential growth, on average 10% for decades. The trade increased from under 10% of GDP to 64% of GDP (BloombergBusiness, 2015). China has become the world's second largest economy now chasing the U.S and expecting to over-take the U.S. economy by 2028. They together make up almost 40 percent of the world economy.

Ideally, globalization is based on David Ricardo's (1817) principle of comparative advantage. It refers to the ability of a country to produce a particular good or service at a lower marginal and opportunity cost over another. Economist Paul Craig Roberts (2003) notes that the comparative advantage principles do not hold where the factors of production such as capital and technology are internationally mobile.²⁶³ He explains that a Chinese worker working with U.S. capital and technology is just as productive as an American however he is paid a small fraction of his American counterpart. An iPhone worker in China makes \$1.78 an hour that would cost \$30 in USA. Labor costs are still a small part of the overall cost structure. As an example, iPhone 5 is sold at \$749 without contract. The material cost is \$209, 28% of the total

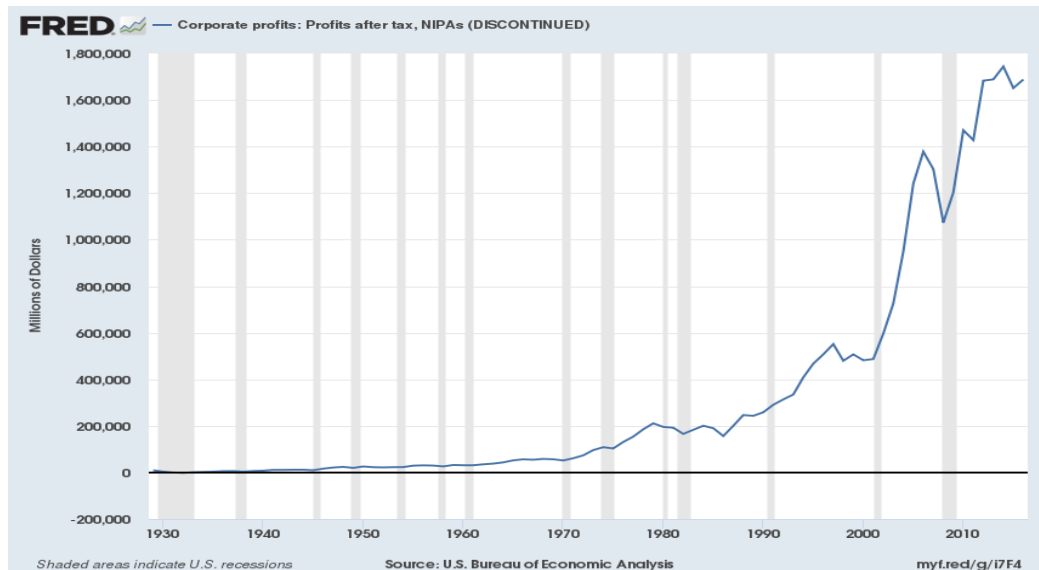


Figure 21: Corporate Profits after Tax (U.S.A.)

(Source: <https://research.stlouisfed.org/fred2/series/A055RC0A144NBEA/>)

value and labor cost is only \$8, which is 1% of the total value (Oswaks, 2012). If it were manufactured in USA, the labor cost would contribute to Horizontal Growth (HG) of the U.S. economy. The rest of the costs imply to shipping, marketing warranty and profit, which accounts for 71% of the value, contributes mostly Vertical Growth (VG) that eventually goes to the big corporations. In other words, if there were no VG or otherwise, the upper MES had sacrificed few dollars, the cost of iPhone 5 would be cheaper even by manufacturing in the United States. Figure 21 shows that the U.S. corporate profit and therefore, income of the wealthy rose sharply and caused the “Great Divergence”. It also shows that the corporate profit has relationship with the falling balance on trade of merchandising.

Krugman (2008) estimated that between 1980 and 2005, more than 80 percent of total increase in the Americans’ income had gone to the top 1 percent. On the other hand, Ronald Reagan added \$1.86 trillion federal debt, a 186 percent increase from the \$998 billion debt at the end of Carter's last budget and Reaganomics didn't work to grow the economy enough to offset tax cuts (Amadeo, 2018). President Trump, applying both supply-side economics (corporate tax cut) and demand-side (infrastructural development projects) at the same time hoping to create more jobs and economic growth while the U.S. economy is already in Minsky’s speculative finance phase with

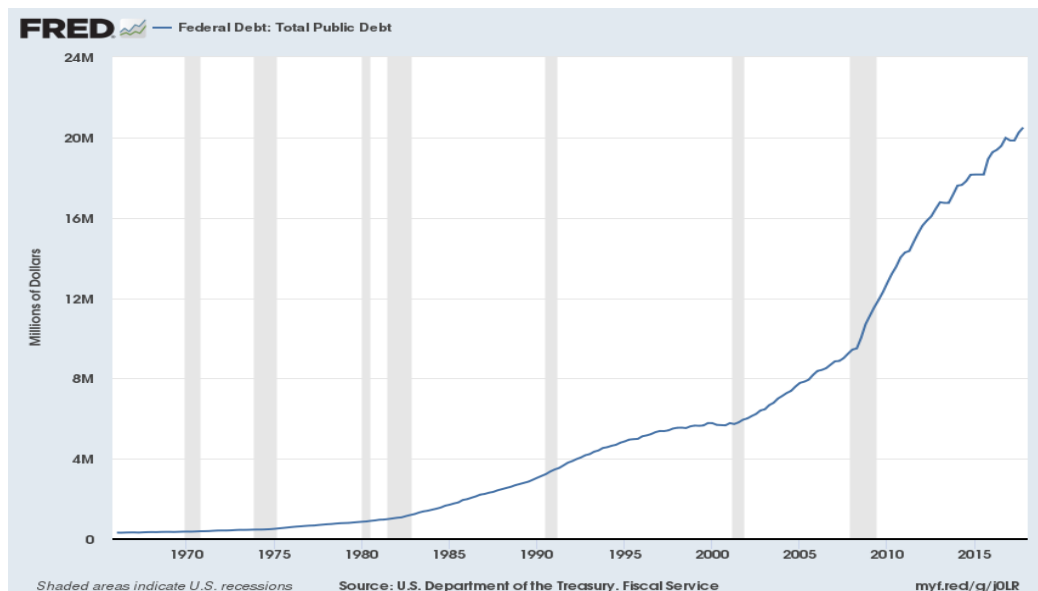


Figure 22: The U.S. Federal Debt in Millions of Dollars

(Source: <https://fred.stlouisfed.org/series/GFDEBTN>)

over \$22 Trillion debt if not in more severe Ponzi finance phase already. Minsky (1992) describes that a long periods of prosperity and increasing value of investments lead to increasing speculation using borrowed money. More loans lead to more investment, and the economy grows further. Since the end point is not known, that provokes the firms and the lenders taking more risks beyond their ability to handle. This means future economy is wagered to be much bigger than existing economy, which at some point is impossible. Figure 22 shows an exponential rise of the U.S. Federal debt following Reaganomics and took further sharp turn with the U.S. involvements in the wars in the Middle East, primarily for grabbing the control of the oil fields to cater the wager.

On the other hand, the initial success of Reaganomics created a craze for consumerism all over the world at blazing rate. It attracted the other parts of the world. The breakdown of Soviet Union and demise of socialism in Europe are seen as apparent success of capitalism. Russia's wish for transition from planned economy to market economy attracted top American economists who prescribed a "shock therapy" that ended up creating a Money Loop (ML) of "oligarchs" and a Market Energy Loop (MEL) of privileged.

Now in a globalized world, all coming together—every single economy is under a growth compulsion that has created a global partnership of capitalists—a big “Global Pareto Coalition (GPC)” (Zaman, 2016) as shown in Figure 23. Although the GPC

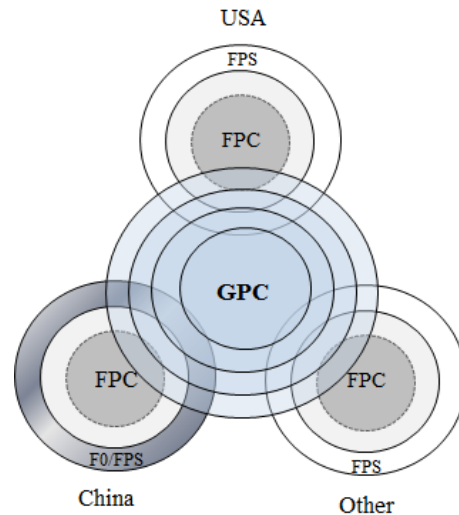


Figure 23: Global Pareto Coalition (GPC)

connects the PCs of each country, the respective Final Pareto Spaces (FPSs) are locally separated by respective local Final Biased Equilibrium Barriers (FBEBs). Now we have a “Global Differential Market Model (GDMM)”, where the higher MESs consolidates all the money in a global Money Loop (GML). A GDMM represents a “Global Market Energy Loop (GMEL)”.

The deal to price oil in USD with Saudi Arabia secured the role of the dollar as the global reserve currency. This put USA in a unique position in GDMM to promote US Treasury securities as safe heaven investment. As per definition of Pareto Coalition, unilateral withdrawal of foreign capital highly unlikely, particularly since the vast majority of the investors is private entities that presumably would find it difficult to coordinate a withdrawal. Involvement with financial markets have made wealthy wealthier and influenced further deregulation to translate GML into GMEL. Following Margaret Thatcher’s “Big Bang” (Davies, 2013) change of financial market structure in England, the U.S. Federal Reserve and the U.S. governments continued deregulation of the financial markets and finally Glass-Steagall Act was officially repealed in 1999 by passing Financial Modernization Act. The concept of

ML describes a situation where law of diminishing marginal utility fails (say, for financial assets) but law of diminishing return is valid in context of energy behind the capital growth. The Financial Modernization Act (1999) promoted innovation of financial products by exploiting advancements in computing and information technology (Yeager, 2007). The global shift toward financial capitalism has connected the global financial markets each other at the same time it has added more vulnerability to major financial crisis and recession.

The GMEL is reflected in the growth of the Gross World Product (GWP) as shown in Figure 24. The GWP in 2013 was about US\$75.59 trillion 84% up in a decade from Kingdom on 6% and France 5%. Since 2007 China leads the expansion, which

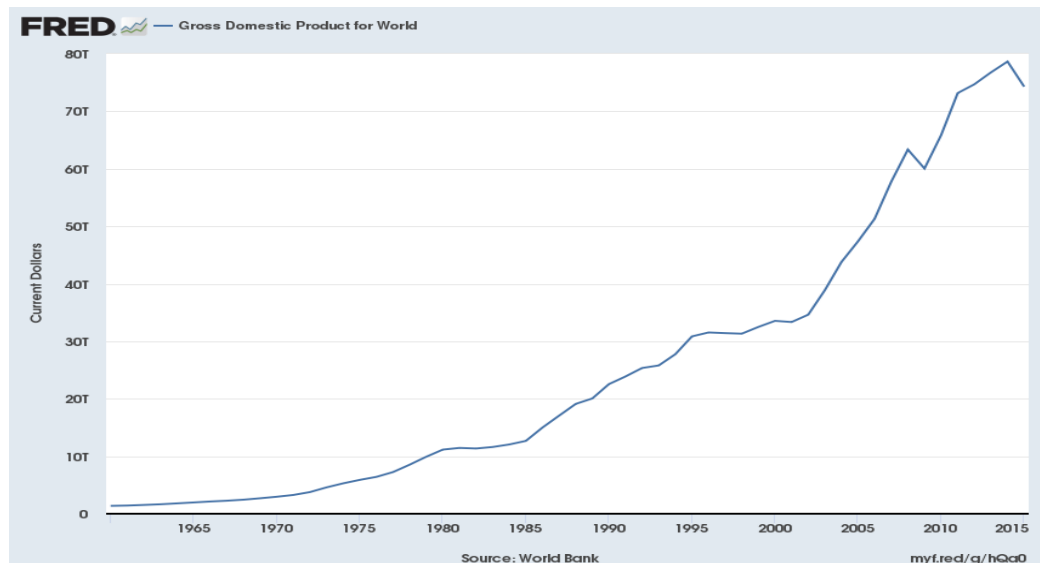


Figure 24: Gross Domestic Product of the World

(Source: <https://research.stlouisfed.org/fred2/series/MKTGDP1WA646NWDB/>)

\$41 trillion in 2000. The U.S. economy alone led the \$17.4 trillion GWP expansion between 2000 and 2006 by contributing 20%, China 9%, Germany 6%, United accounts for 12%, while the United States accounted for 10% of the global output expansion. Paul Krugman (1995) argues that trade liberalization has a measurable effect on the rising inequality in the United States. He attributes this trend to the increased trade with poor countries like China, resulting in low skilled jobs becoming more tradable. We know by now, China no more dependent on low-skilled job, now China leads the world in hi-tech industries such as electronics, telecommunication

products, machinery, ships, rail cars, automobiles and so on. In 2009, China surpassed the United States as the world's largest automobile producer by volume (Source: ChinaAutoWeb.com). China is now the world's biggest producer of concrete, steel, fastest trains, ships and textiles, and has the world's largest automobile market. Chinese steel output is one-third of global production, with productivity exceeds Western productivity (Rawski, 2008). From 1975 to 2017, China's automobile production rose from 139,800 to 29 million (Source: ChinaAutoWeb.com). All these big things have happened in China in an unimaginably short timeframe because of economic reform and pressure from international competition due to globalization but by burning a huge amount of coal, often called a “coal fired economic growth”. This growth compulsion is reflected in the per capita CO₂ emission as shown in Figure 25, which is now hard to reduce. The figure shows that per capita CO₂ emission for China

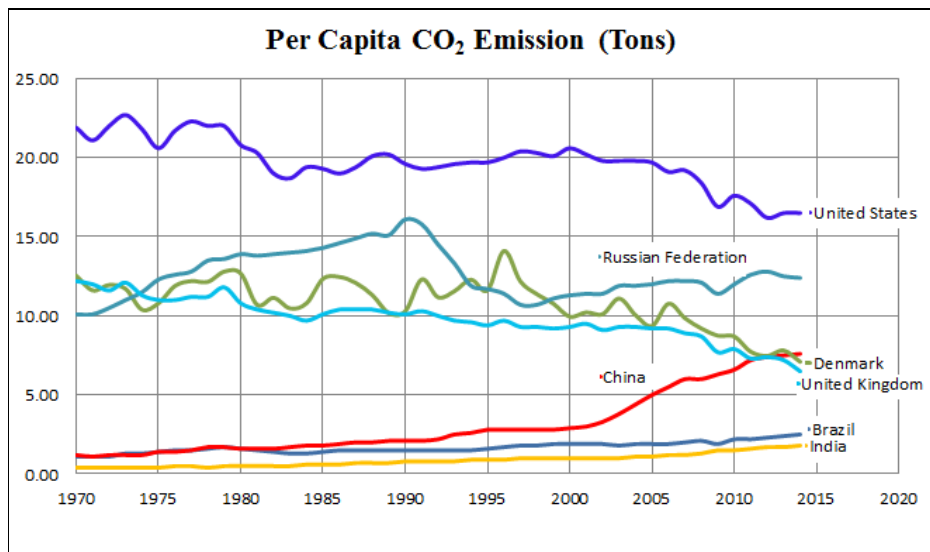


Figure 25: Per Capita CO₂ Emission

(Data Source: http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts_pc1990-2014)

increased from 1.2 tons in 1970 to 7.6 tons in 2014 per capita CO₂ emission for China increased from 1.2 tons in 1970 to 7.6 tons in 2014 (over 6 times), particularly the jump from 2.1 tons in 1990 was tremendous. For India it increased from 0.4 tons in 1970 to 1.8 tons (4.5 times) in 2014, for Brazil about 2 times (Kumar, 2015). The Per capita emissions in the U.S. and in European countries remain stable or somewhat decreased because of moving out most of their emission producing manufacturing

such as to China & India. India is aiming for producing 1.5 billion metric tons of coal by 2020, up about 600 million tons in 2012 (Kumar, 2015). These two countries still need to burn a huge amount of fossil fuel to lift hundreds of millions of people out of poverty. As an example, it is estimated that another 200 million people could join China's urban areas by 2023 (Jericho, 2014). Rapid urbanization impacts rural areas through Price Pressure (PP), which pulls more people to urban areas and causes more

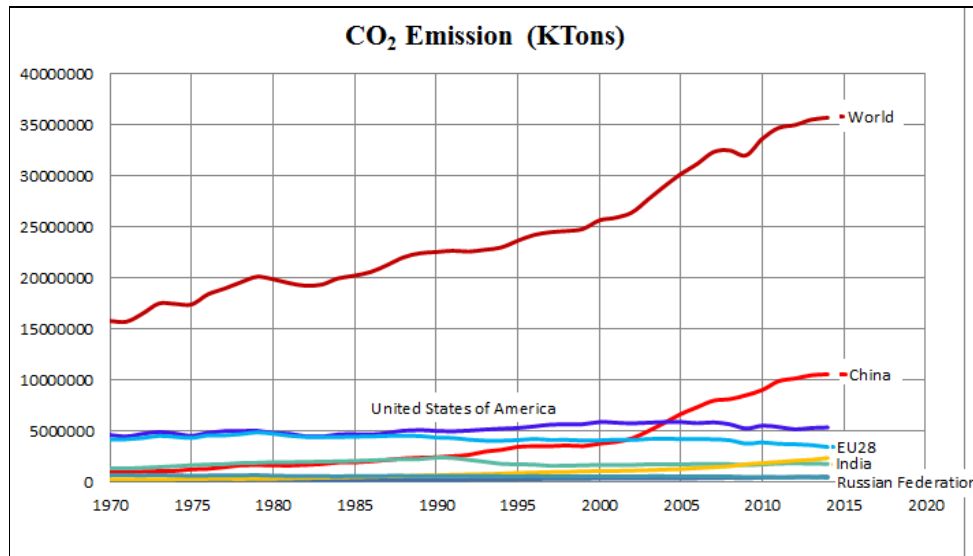


Figure 26: CO2 Emission of China, EU, India, Russia, USA & the World

(Data Source: <http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2014&sort=des9>)

burning of fossil fuels and thereby more CO₂ emissions. This cannot be right strategy for a sustainable economic development. What if per capita CO₂ emission in China reaches to the level of developed world?

As we are burning fossil fuel and increased rate, not only depleting this this vital resource fast enough to destroy our economies but also at the same time, a huge amount of carbon dioxide gas and other greenhouse gases are released in the atmosphere, which traps more heat called “global warming”. Severely enough, it is causing shrinking of glaciers, that is, wiping out sources of fresh water on one hand and rise of sea levels on the other. The consequences are going to be cataclysmic climate impacts, serious energy shortage and fresh water scarcity. Although since the

early 20th century earth's mean surface temperature has increased by about 0.8°C (IPCC, 2007), Figure 27 shows about three-fourth of the increase occurring since 1970.⁴⁶ This timeline has relationship with financial deregulation and globalization promoted by economists and policy makers after economic stagflation of 1970s, which have induced consumerism at unprecedented rate. A sustained global warming of more than 2 °C (relative to pre-industrial levels) could lead to eventual sea level rise of around 1 to 4 m due to thermal expansion of sea water and the melting of glaciers and small ice caps (National Research Council, 2011). It will be a devastating

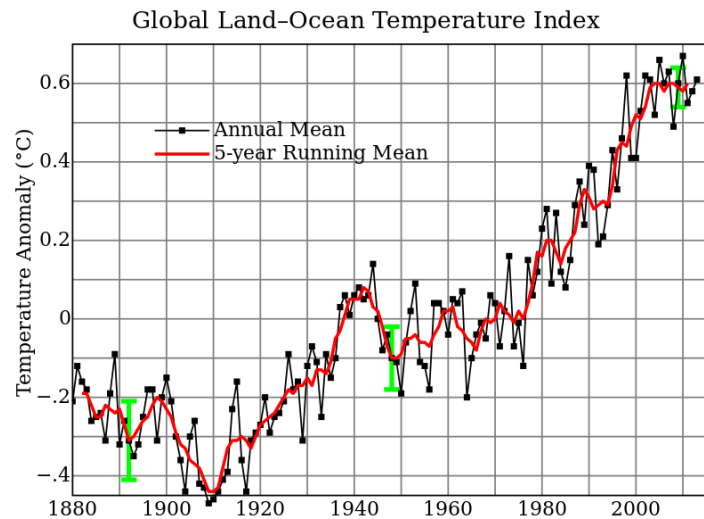


Figure 27: Global Annual Mean Surface Air Temperature Change (NASA)

(Source: http://data.giss.nasa.gov/gistemp/graphs_v3/)

impact since not only limited to rising sea level or salinization but also once the glaciers dry out, in turn the rivers will also dry out so as the other sources of fresh water. The consequence may be as severe as famine and plague.

There are two kinds of challenges that are big global concern now. The first type is ecological crisis, the global warming and fossil fuel depletion that call for slowing down economic growth to a sustainable economy. And the second type challenge is debt, poverty, inequality and unemployment that call for more growth. As corporate profits are rising after financial deregulations, they have been in a better position to integrate and control the global economies where they internalize profits and externalize costs to local people and future generations. All the countries in the world are now inseparably dependent on growth with the corporations to keep their

economic engines running. Although we have seen that growth under BE does not solve the inequality problems rather enhance the gap between rich and poor. Following the existing trend of growth, the economies are going to crash by burning all the fossil fuel reserves and heating up the planet. We are now in such a dilemma, may be called as Capitalist's Dilemma (CD) (Zaman, 2012b & 2016) that none of the paths, growth or no-growth we can choose from. Even the Core Capitalists are not free from CD and they are very aware of the dwindling resources. Unfortunately, they have their solution of CD is selfishly saving their own little domain only. Is there still any hope that we can save our only planet earth for the whole mankind?

7.0 New Sustainability Concept

“Our problems are manmade—therefore, they can be solved by man. And man can be as big as he wants. No problem of human destiny is beyond human beings. Man's reason and spirit have often solved the seemingly unsolvable—and we believe they can do it again.”

—John F. Kennedy “A Strategy of Peace (1963)”

The current trajectory of growth based economy is taking us toward its dead end. In his recent book “Afterburn” Richard Heinberg (2015) summarizes the trajectory:

[W]e have already reached the point of diminishing returns for investments in world oil production.....the same time, burning Earth's vast storehouses of ancient sunlight releases carbon dioxide into the atmosphere, resulting in global warming and ocean acidification.....Climate change is contributing to a mass extinction of species, extreme weather, and rising sea levels—which, taken together, could undermine the viability of civilization itself.....If civilization fails, then we will have no need for cars, trucks, aircraft, ships, power plants, or furnaces—or for the oil, coal, and gas that fuel them.²

Figure 28 below summarizes our history of industrial civilization (not on scale) with respect to capital accumulation. The capital accumulation here is symbolic of what we piled up in terms of money, assets or infrastructures in our fossil fuel based globalized way of life. The more we have moved on along the trajectory, we have added complexity and helped consolidate the financial powers. The figure shows the sequence of ages mentioned by Carroll Quigley in his book “Tragedy and Hope” that

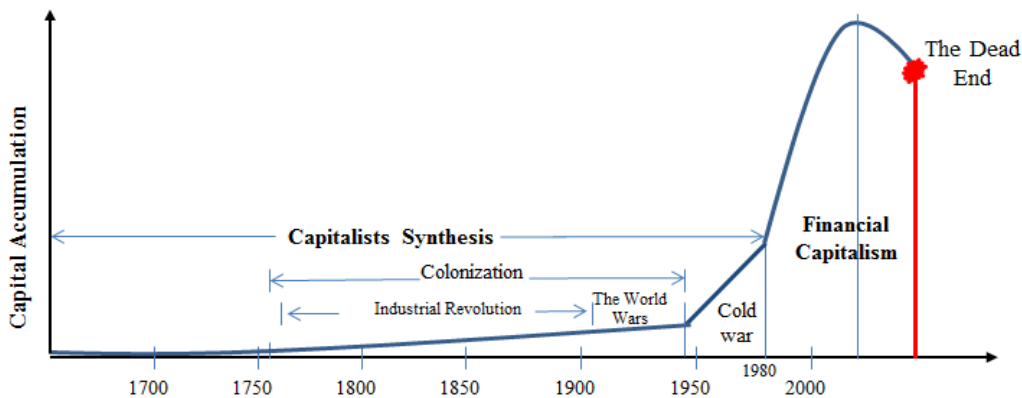


Figure 28: Current Economic Trajectory (Example only, not drawn in scale)

capital accumulation continued as we moved from the Age of Conflicts (the World Wars) and an Age of Expansion (during Cold Wars) until finally reached to the existing Age of Universal Financial Empire, mostly after financial deregulations in dominating countries, where the capital accumulations have happened. However, a monstrous growth of financial derivatives—way bigger than the total world GDP, which have gained enough might to bring the whole financial system down to the dead end of the carrying capacity of the earth. Our industrial civilization now riding on financial capitalism has taken off the ground for reaching to its tragic end just like a moth to a flame. On its way, it is irreversibly and progressively damaging the environment and exhausting its lifeblood fossil fuel reserves. If a big financial crisis hard hits global economy, the possibility of alternate renewable energy to take over may disappear. Since crises are converging and gaining potential to explode, the existence of our civilization is being challenged.

It does not matter where the growths are happening in context of finite resources since once the resources will be used up, the impact will spread all over the world. Historically neoliberal economists and policy makers used crisis as opportunities to promote privatization and globalization, which is now accelerating the dooms day.

Figure 29 below shows that an alternative trajectory bypassing the dead-end. If we think technology or innovation will change our trajectory, it will be pipedream until and unless we make a pathway for technology to reach to us. Since CO₂ emission is accumulating in atmosphere at higher rate every year, we will have to reduce greenhouse gas emissions at much higher rate ever.

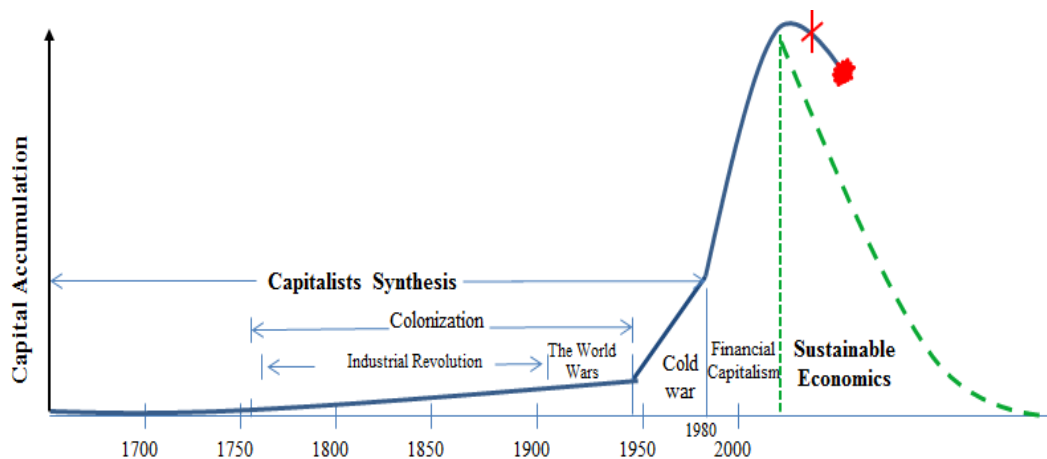


Figure 29: Switching the Trajectory (Example only, not drawn in scale)

The issues like ecological crisis, poverty or cultural deterioration that are created within existing institutional and market structure have not been properly addressed or overlooked by mainstream economic theories but they are now challenges to our policy makers. This model explains that the concept of green economics 'managing economics for nature as usual' is much of a HLP, which is deviated and distorted by information biasing chain works on it from vertical direction. A biasing chain constitutes a values framework. The solution of many economic, social and ecological problems that are yet challenges to our policy makers may require our existing Values Framework (VF) to improve. This is true for the Paris Agreement on climate change to contain the increase in the global average temperature 1.5°C - 2°C above pre-industrial levels, even it is legally binding for all 195 participating countries (CBC News, 2015). If one major country fails to meet this agreement, the others will get excuses to fail as J. F. Kennedy's "strategy of peace" has failed.

Now the dilemmas posed by capitalism or even socialism are actually result of Biased Pareto Improvement (BPI). On the other hand, the absolute Pareto improvement that is achieved independent of any biasing may be called as Unbiased Pareto Improvement (UPI). An important criterion of BPI is that it is measured in price dimension. However, in presence of BE price may not convey the actual value. In presence of ML, price conveys inflated information or some other cases, price may undermine the real worth of the things that have very high importance for humanity. Every Pareto improvement has price dependent (BPI) and price independent (UPI)

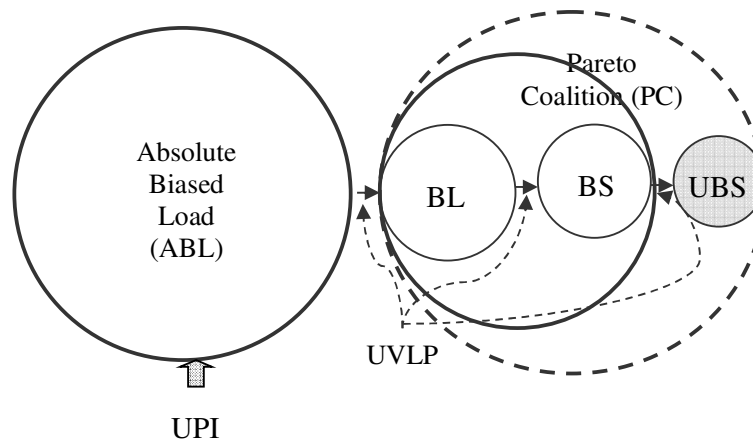


Figure 30: Unbiased Pareto Improvement (UPI) for PS

components but in different combinations. As an example, using fossil fuel to heat water or household electricity is much of a BPI. On the other hand, using solar panel to do the same job is much of a UPI. The first one focuses on better off in monetary values whereas the other focuses on better off in real human value. From income perspective, BPI will be achieved if dollar income increases, that is, the ultimate outcome is ‘growth’. However, in case of UPI, human value has to be increased. For simplicity, if a target group is better off at lower than market price, then it can be treated as UPI. Those who do not fit within existing market structure, UPI may care and protect them.

An aggressive and persistent green UPI movement focusing local economy may make the Final Pareto Space (FPS) a green source of information. The information will go up all the way up to the UBS through **Unbiased Vertical Learning Process (UVLP)** (Zaman, 2016). The concept of UPI tells that it is possible to achieve better economy, better human values or better environment by actively bypassing corporate biasing such as liberating local economy, using more organic fertilizers or less pesticide for food production and becoming less reliant on medicine but on exercise for better health. If we recognize the crisis or economic problems that we are facing such as climate change, financial crisis, poverty, inequalities all are result of economics of information biasing, the solution is UPI with a greater force. This strategy may be called as “**UPI Fast Strategy (UFS)**” (Zaman, 2016). UFS is distributive not accumulative and therefore, it will liberate local economies for solution of their

economic problems depending on local strengths. Rapid localization using renewable energy will counteract the biasing chain. The easiest way is to counteract the biasing chain is from the very bottom of the chain of an economy that is its FPS who are the ultimate victims now or will be victim in future. In fact, each and every individual in this world will be future victim of climate change and fossil fuel disappearance—it is just matter of time.

As a community we can reduce consumption of energy locally, grow foods locally and help each other's needs as UPI. It will also better prepare ourselves to respond to the climatic and economic impacts when the time will come. If substantial number localities begin to respond on this and they will motivate others as HLP, in turn, it will lessen the global carbon burden as UVLP. At the highest level of imagination, if UVLP works perfectly, the economy will run by itself with true human values. I called this as **“Auto-Adjust’ Switch-Over (A²S)** (Zaman, 2012c) to a steady-state economy. This is very important because of the following reasons (Zaman, 2016):

1. The end of oil will also be end of globalization. Much of the local needs are to be locally produced and locally consumed. Local economy, local food production is to be strengthened and liberated right now.
2. Continuity of energy supply for sustainability. Build sufficient renewable energy infrastructure for future use. If there is any disconnect, it will be much difficult to produce solar panels or batteries after economic depletion of the fossil fuel. Economic depletion of fossil fuel will happen long before the actual depletion of fossil fuel may be followed by a long-term financial crisis.
3. Keep baseline reserve of fossil energy until we are prepared to live without. We will have to set priority, where we will continue fossil fuel and where fossil fuel must be replaced by renewable energy sources.
4. Buy time so that our kids are prepared to embrace the new challenges. If there is disconnect from the continuity of energy supply for sustainability, there will be no way to produce ‘green’ renewable energy like solar panels or batteries after depletion of the fossil fuel. For that we will have to set priority, where we will continue fossil fuel and where fossil fuel must be replaced by renewable energy sources.

5. Preserve our knowledge and continue research for new technology (e.g., new powerful batteries, less irrigation high yield crops).
6. Protect the world from 'blackout', the potential disaster like civil war, famine etc. (the blackout) during the transition. If there is a war it will burn the remaining reserve of fossil fuel and leave us in an irrevocable eternal disaster.
7. Smooth institutional reform for Green Economy.
8. Develop and empower communities based on human relationships for meeting most of the local economic and social needs such as food, healthcare, education, entertainment and even renewable energy locally as much as possible.

The (A²S) strategy is aimed to connect all the people of the world for smooth institutional reform toward Green Economy. At the beginning the objective of UFS should be to make the FPS or ABL as a green source of information for an end to end communication through UVLP up to the UBS. During this time the economies will grow due to better information flow within an economy. Therefore, this will be the time for addressing the problems like poverty and inequalities. This will also be the time to set up priorities to reduce per capita energy usage and roadmap toward a sustainable economy such as building renewable energy infrastructure, promoting permaculture for urban areas and local agriculture to achieve food sustainability, empowering community relationship and so on. Once the end to end communication is established from ABL (or FPS) to UBS through UVLP, BVLP will be weakened and the HLP will be strengthen. This means local economy and community relationship will be liberated or empowered to run the economy during this process. In this way, economic growth might be auto adjusted with carrying capacity of the earth. The economics of establishing these learning processes can be called as '**Greenhouse Care Economics**' (GhCE) (Zaman, 2001). It will call for a coherent co-operation from the core capitalists in the pursuit of sustainable economy, energy access, energy security and low-carbon economic growth and prosperity.

The objectives of GhCE can be achieved if a number of institutions either dedicated or undedicated to the target people collaborate under some defined guidelines. The institutional framework to support GhCE can be named a **Greenhouse Care Economics Framework (GhCEF)** (Zaman, 2009). A realistic model of GhCEF

should displace complex solutions to the environmental, financial and economic problems with that are simple and yet effective.

As shown in Figure 31, the 'A² Economy' has two stages. The first stage may be called 'positive growth stage' or 'G+ Stage' and the second stage may be called as 'negative growth stage' or 'G- Stage'. The 'G+ Stage' can be green focused, for example, setting up renewable energy and its spare parts plants, electric vehicles, using bicycles, creating water reservoirs, growing fruits and vegetables using organic fertilizers, encouraging tree plantations and creating green jobs. The countries with high export earnings, can build these infrastructures during this phase. The first stage using bicycles, creating water reservoirs, growing fruits and vegetables using organic

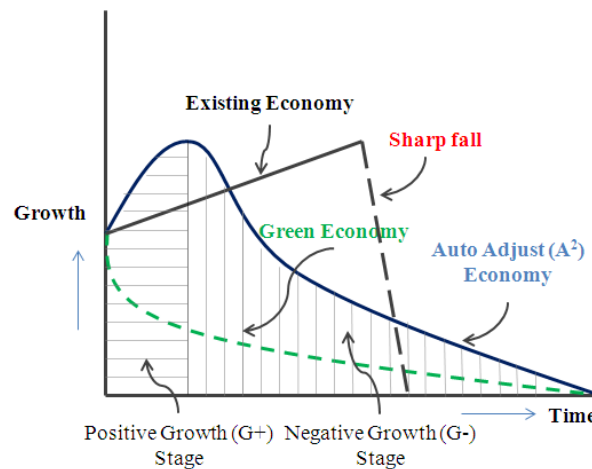


Figure 31: The Strategy-Auto Adjust (A²) Economy

fertilizers, encouraging tree plantations and creating green jobs. The countries with high export earnings, can build these infrastructures during this phase. The first stage (G+) will be the most challenging part and it will require comprehensive UPI efforts to address poverty and unemployment but by reducing per capita energy usages. If the end to end communication from the ABL to UBS is established considering the ABL as a green source of unbiased information, the 'auto-adjust' transition process will begin to work.

To address externalization problems of corporations, I proposed to prepare an economy for the transition phase through positive green growth (G+) under a GhCEF. As an example, workers share can bring Internal Green Dynamics (IGD) (Zaman,

2001 & 2016) in green industry where their collective share will be accumulated more rapidly than that of their employer. Someday in the period of perpetuity the workers collectively will intend to dominate over their employer as shown in Figure 32. Eventually IGD will trigger External Green Dynamics (EGD) (Zaman, 2001 & 2016) which will expand the green industry with economics of scale and will create more new jobs and opportunities for others. The workers share option will give them the opportunity to participate in decision making for better healthcare, education and other welfare support from their companies. In the long run, it will be realized that a workers share is not a tool to provide higher income for the workers, but to provide them with better access and create green dynamics in healthcare, education and housing services etc. Similarly, local poor people of a community can be brought under virtual coalitions to address much of their needs and opportunities locally

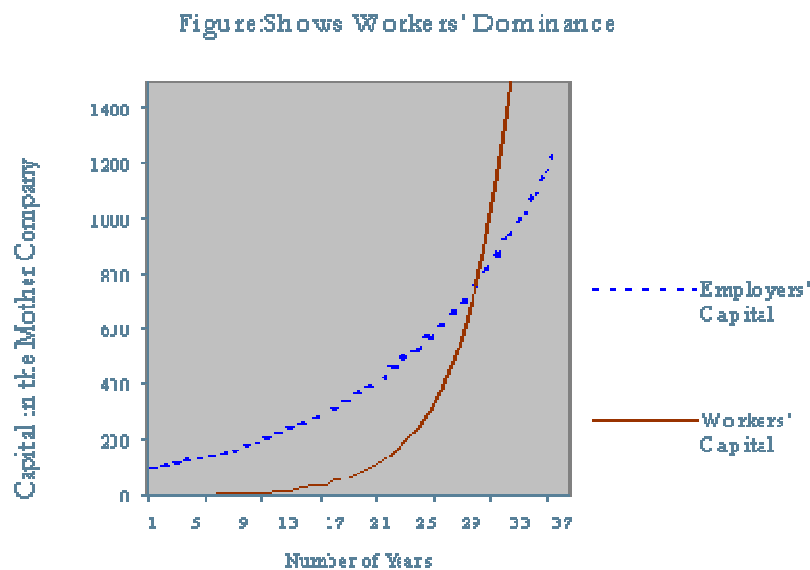


Figure 32: workers' dominance in a green industry

through to enhance quality of their lives. In named the coalitions of the poor people and industrial workers as Green Coalition Zero (GC0) (Zaman 2012c & 2016). The UFS for GC0 under GhCEF will gradually eliminate ML and MEL from the economy and thus there will be negative growth (G-) in energy intensive trade and manufacturing sectors. However green sectors will still grow and therefore, societies will tend to be locally self-sufficient.

Although we cannot motivate the policymakers for an action to prevent the biggest disaster of human history but we may try to motivate poor people to solve poverty problem through **UFS**. There are historical and institutional reasons behind poverty but if poverty problem is not solved before peak oil, the post peak period will be disastrous for both the rich and the poor. Interestingly, solving poverty problems, the mainstream theories say to increase competition for more growth and consumption for better distribution of wealth. In reality, due to **BE** between rich and poor, increased consumption generates more wealth for the rich but may trickle down some to the poor. If the poor people are exposed to the market as a collective body **GC0**, their collective presence not only will counteract the causes of poverty but will also create immunity against poverty.

A government may introduce 'green bonds' or 'green infrastructure bond' that will allow individuals to invest in building and operating low-carbon infrastructure, such as offshore wind turbines and grid connections, which will also create green jobs. This means green bonds will be asset backed and sustainable and survive even when fossil fuel will become expensive and unavailable. There are trillions of dollars long-term assets are held by capitalists, a part of which can be allocated for buying green bonds or green infrastructure development otherwise their values will sharply decline when 'peak oil' will be visible. It is also important to highlight here that 'peak oil' may not be visible when physical reserve reaches at 'peak' since economic 'peak' can be masked by debt market. A government may also introduce registered green bonds, which may be tax deductible similar to registered retirement savings plan in Canada. In this way, a GhCEF can be designed to attract investors for a massive scale green infrastructure development. It is very important to note that the renewable energy sector is not fully independent since still we need carbon products and fossil fuel for manufacturing parts for solar panels, wind turbine, blades, storage system such as batteries, grid upgrade etc. A country may build these industries locally including upgrade of grid to make compatible with renewable energy under the GhCEF. The investors for these programs can be called as Green Coalition of Investors (GCI) (Zaman, 2016). Once few projects are successful, CGI will grow bigger and it may become similar massive infrastructure building activities as building railroads during Victorian era.

At the beginning of this event, the urban people will begin to lose their jobs. As a result, they default in mortgage, pay utility bills (as also utility bills will be high) or buy food. The cities will lose taxes; the financial industry will be bankrupts because of increased number of foreclosures. Many U.S. cities are already showing these early symptoms. As the impacts of shrinking economy and climate change will become intense, the history tells the impoverished masses will have no choice but to starve. The deprived people and new generation may revolt against the power elites who control the biasing chain—a civil war may spread. To avoid this, following Cuba's Urban Agricultural Movement experience, we may now proactively form coalitions of urban people (say, Green Coalition Urban or GCU) under a GhCEF (Zaman, 2016). It will need to formally through formally or informally train them on "Permaculture" and organic agriculture. Cuba already set an example by making a drastic move to convert every piece of arable land to organic agriculture using permaculture. Organic agriculture includes rebuilding the top soil using organic seeds, bio-fertilizers, bio-pesticides, organic composts and worm humus. Today 80% of Cuba's agricultural production is organic (Morgan, 2006). Following Cuba model, training institutes can be set up under GHCEF for "train the trainer courses" on permaculture in a way that enhance human and community relationship. The profession training courses needs to be redesigned that will best suit for the new post fossil-fuel economy. The educational institutes, the total health care system will need to be decentralized and therefore, more healthcare professionals, more doctors, teachers will be needed. The existing highly paid doctors of urban hospitals or teachers of private universities will not be willing to go rural areas but they may be motivated and engaged for training others from different locations. If all these efforts once begins as UFS, it will eventually unlock HLP which will lead to an A²S to a sustainable economy.

As the economic and ecological crises are converging along with the decline of resources including fossil fuel and fresh water, the existing economic and governmental power structures will break up. When the crisis will begin, the young people will be in the front line either in conflict or in co-operation. The elderly generations who are still on control of the biasing chain may redirect the conflicts toward different directions – religions, immigrants, leftists or rightists that will make the situation worse. On the other hand, the younger generations (Generation Z) are the ones who will most forcibly face the consequences of climate change, and their

attitude toward older generations may not be forgiving.³⁰ Therefore, I proposed another type of virtual coalition under a GhCEF, called “**Green Coalitions Z (GCZ)**” comprised of Generation Z people (Zaman, 2016). The coalitions can be formed to solve their specific problems following various comprehensive **UFS** strategies. As an example like **GCU**, if the younger generations are educated, trained and prepared for facing the crisis pro-actively such as building community relationship, grow gardens, permaculture, reuse, repair, help, share and care, they can lead us toward comfortable transition to sustainable economy.

It is much safer to be aggressive in helping poor people or building green infrastructures for our future generation than creating panic. The efforts for formation of the green coalitions such as GC0, GCI, GCU and GCZ will spur many other coalitions of green activists, scientists, politicians and so on through HLP around the world. These coalitions will counteract the biasing chain of the core capitalists and therefore, any biasing will be auto-negotiated to a win-win outcome through Unbiased Vertical Learning Process (UVLP). These learning processes will create an immune system within a local economy against external biasing.

8.0 Conclusion

As per definition of sustainable economy we should reach to a boiling point—the changes of UFS are to be seen everywhere in an economy from a small village community to downtown financial industry. Like J.F. Kennedy’s (1963) definition of peace, “sustainability” is also “sum of many acts”, “dynamic, not static” and a process—a way of solving problems.”

Finally when the transition will be completed, the economy will land to a full-fledged steady-state economy or ‘Green Economy’ guided by natural information of HLP alone as opposed to existing BVLP. This strategy will create opportunities for every individual for their own survival but staying together. Meanwhile, we will have to preserve our knowledge and continue research for new technology. Bear in mind, meanwhile, if there is a war it will leave us in an eternal disaster. Otherwise, we may find light at the end of the tunnel and a smooth transition to a sustainable economy.

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